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Editorial

THIS first issue of *Accounting and Business Research* is itself a demonstration of the nature and purpose of the new enterprise. It would not be strictly accurate to say 'as we begin, so we mean to go on', since no journal attempting to break new ground could or should observe such a rule very closely. Nevertheless the following pages contain a sufficient general illustration of the broad principles on which the journal is being built up.

In the first place the word *Business* in the title means what it says. It is hoped that many of the problems discussed and the projects described will be those that arise in the practical context of industry and commerce. The articles by John Sizer on 'A Risk Analysis Approach to Marginal Cost Pricing' and C. A. Westwick on 'Towards a New Measure and Use of Gearing' fall into this category. These are articles *about* business. It is also intended to include articles *from* business, written by those engaged in it, including accountants. This is the hardest type of article to obtain for a journal concerned with the publication to the world of the progress of research carried out under private auspices and often at the private expense of the companies concerned. However, some articles of this type are already in hand and it is hoped to publish them in later issues of *Accounting and Business Research* of which the second is expected to appear early in 1971. An open invitation is also extended to those who are at present concerned with research projects in industry, including management and finance, to submit further articles.

As to the other half of the title, *Accounting Research*, those who think they need a definition of the term can work towards it by observing what goes

on under that head. There are the eight volumes of the quarterly journal of that name, published for the Incorporated Accountants' Research Committee between 1948 and 1957, to which *Accounting and Business Research* is a conscious successor. There is David Solomons' article on pages 11-17 of this issue to show just what is being undertaken in the United States. And there are the contents of this first issue including, for example, Harold Edey on Profit.

There is also room for the more specifically academic contribution – using that word in its proper and honourable sense and not with the dismissive connotation in which it is too often employed. Thus we have R. K. Khanna and J. A. Bottomley on 'Costs and Returns on Graduates of the University of Bradford' and Basil Yamey on 'Closing the Ledger, Simon Stevin and the British Balance Sheet.'

Topicality is certainly no bar to the inclusion of an article in *Accounting and Business Research*. Indeed it is hoped that a substantial proportion of the articles published will be of direct relevance to current issues. The articles by G. Gibbs on 'Accounting Principles: "Generally accepted" By Whom?' and again by Harold Edey on 'The Nature of Profit' have an urgent topical reference clear to all who have followed the affairs of the profession in the past few months.

The first four issues of *Accounting and Business Research* will possibly appear at irregular intervals until all the machinery is working well. It is hoped to achieve quarterly publication as soon as possible. After that the success of the venture will depend on the amount and quality of the research work being done and of the articles coming forward from the whole field of accountancy and business.

Cost Estimating Under Uncertainty

Kenneth Simmonds and Robert Vause

When preparing cost estimates for pricing large capital projects the estimator will always be confronted with some costs that may or may not arise, or that may vary according to conditions which are themselves uncertain. Common causes of cost variation which can never be entirely eliminated are weather, labour problems and employee error. Estimators thus always prepare their estimates under some degree of uncertainty – and this will be the case no matter how great their prior experience or their estimating success with the type of project under consideration.

While there are numerous theoretical discussions of how uncertainty should be treated,^{1, 5} the practical problems of evaluating uncertainty and incorporating it in cost estimates have received scant attention. Many cost accounting and estimating texts fail even to mention uncertainty in connection with job costing. Recommendations as to practical procedures for evaluating uncertainty are urgently needed, but they must be based on more than an examination of theoretical models. There are very real problems in quantifying uncertainty in practice. What is needed as a starting point is a great deal more knowledge about how estimators record the uncertainty they undoubtedly confront in all estimates. The simple question: 'How do estimators in practice take uncertainty into account?' is the focal point of the research reported here.

The study was confined to cost estimates prepared for tendering by capital goods firms, and the work of 68 estimators employed in eight different business units was covered. The picture that emerged was of an estimating art based on a mixture of rational calculation, emotive ritual, and personal preference. Throughout the estimates studied there was no clear indication of what allowances for uncertain costs were incorporated, no written indication of any probabilities being used to calculate the allowances that could be traced, and no clear indication of what cost concept was meant to be represented. Moreover, there was

surprisingly little check between estimated and actual costs.

The authors have no doubt that this picture is common to many firms – a reflection of the state of the art of estimating, not of a selection of backward firms. Both estimating practice and estimating literature thus leave considerable scope for improved approaches in estimating uncertain costs. One such approach is suggested at the end of this paper.

Expected cost and utility

While this paper is not primarily concerned with theoretical concepts and definitions with respect to uncertainty, a brief discussion of some underlying concepts is necessary at this point to provide the basis for assessing estimating practice. A specification for rational evaluation of uncertainty provides a datum for assessing in what ways cost estimating practices deviate from rationality.

When there are indirect penalties resulting from losses – perhaps dismissal of a responsible executive or bankruptcy of the firm – it has been argued that the range and likelihood of possible cost outcomes should be an important consideration for the pricing decision maker.^{1, 5} He will want to weight his selection of opportunities and prices against high cost outcomes. Given the decision maker's utility function and the distribution of potential costs for an individual opportunity it is theoretically possible to produce a single figure cost estimate that would take both into account.¹ In practice, however, any adjustments for utility are best left to be made by the decision maker. Otherwise the cost estimator will continually need to adjust the cost concepts to which he is working to take account of utility variations over time or between those using the estimate. Consistently prepared cost estimates, moreover, are needed for control purposes and for pricing decision models. But when utility is a factor in the pricing decision, the need remains for the estimator to provide a distribution of potential cost

outcomes if the decision maker is to adjust for ultimate penalties. The approach suggested at the end of this paper is one way in which estimators might begin to move towards this requirement.

Where there are no indirect penalties resulting from cost deviations from estimate and the decision maker is rational and adopts expected monetary value as the basis for his decisions, it can be shown that expected cost is the appropriate basis for preparation of cost estimates.⁵ Expected cost is defined as a summation of the cost conditional on each uncertain outcome weighted by the probability that each will arise. An example of an expected cost calculation is shown in Exhibit 1, although in this case the uncertainty associated with each individual element of cost is not detailed. Where bias is avoided in the probabilities placed on the outcomes, the resulting expected costs would provide the basis for unbiased pricing decisions and any other basis could produce decisions which, over a range of projects, would give on average a lower attainment of the objectives.

Exhibit 1

Calculation of expected cost

<i>Possible total cost £</i>	<i>Probability that this will be the total cost</i>	<i>Expected cost £</i>
500,000	0.10	50,000
550,000	0.30	165,000
600,000	0.25	150,000
650,000	0.15	97,500
700,000	0.10	70,000
750,000	0.06	45,000
800,000	0.04	32,000
	1.00	£609,500

In designing the research reported here the authors were aware from past experience that the bulk of estimates in practice would be expressed as single figure costs and that specific references to decision makers' utilities would be most unlikely. After all, the concept of utility hardly receives a mention in estimating literature. It was decided, therefore, that expected cost should be taken as the datum concept against which to assess cost estimating practice. Deviations from expected cost would be very likely to bias decisions using the cost data and coincide only accidentally with any utility function of decision makers.

Acceptance of expected cost as the underlying objective for cost estimates does not imply anything about the precision with which estimates are prepared. Where costs of collecting and analysing further data outrun the benefits from greater precision, rough assessments may be all that are justified. Nevertheless,

for single figure cost estimates without utility adjustment expected cost should be the underlying concept, however rough the estimate, and not 'most likely cost' or the outcome of a chain of unrelated cost estimating conventions. A chain of such conventions may produce a cost estimate that is quite meaningless in terms of any model for rational decision making.

The hypotheses

Based on experience from posts held in the capital goods field, prior research work into the estimating and costing of capital goods firms, and a pilot investigation of practice in one firm, the authors advanced seven hypotheses as to how uncertainty is handled by cost estimators in practice. Data was then sought specifically to test these seven:

(i) The majority of cost estimators incorporate lump sum allowances in their estimates as a provision for uncertain costs.

The term 'lump sum allowance' is used here to describe the addition of a single figure to the total estimated ascertainable cost of a project to allow for the uncertainty inherent in the project. Such allowances are frequently called *contingency allowances* and this term is adopted here. Ascertainable costs are those for which the estimator makes a specific estimate. They will differ from project to project but will normally include all those costs that will have to be incurred with certainty before the project can be completed. There will be a minimum material requirement, for example, below which the project could not be completed. In placing a figure on ascertainable costs the estimator may allow for some uncertainty as to their exact level. The hypothesis was not intended to negate this possibility, but rather to claim that some uncertainties would be covered by a contingency allowance.

The addition of a single figure contingency allowance was expected to be the most prevalent practice observed in the study. It has much to recommend it to cost estimators, being relatively simple, quick and easily communicated to others. At the same time, it allows the estimator considerable scope for incorporating his personal experience of unpredictable costs in the past and for a subjective assessment of the risk involved.

(ii) Probabilities are not widely used by estimators in quantifying uncertainty.

This hypothesis follows almost as a corollary to the expectation of lump sum allowances. Estimators expected to use lump sum allowances in their estimates were not expected to place probabilities either on the outcome of uncertain events or the level of

uncertain costs. This hypothesis was supported by the absence of emphasis on the use of probabilities in most of the literature on estimating. Even where probabilities are mentioned, the practical difficulties of gathering and analysing the data and then applying probabilities are usually not explored.⁴ Certainly there was little mention of probabilities in estimating literature when most practising estimators began their careers.

(iii) Some provision for uncertainty is built into the cost estimate before the contingency allowance is added.

The estimator must make a series of assumptions as to the costs likely to be incurred for any project before he can arrive at any estimate of the ascertainable costs. For example, he must allow for the likely productivity of labour in carrying out the order and for a certain amount of material wastage. In placing a cost on these elements he will be making some allowance for uncertainty.

(iv) Estimators specifically quantify price uncertainty on more occasions than incurrence uncertainty.

Price uncertainty arises where the cost rate for any element of a project is subject to change by the time the order is carried out. Incurrence uncertainty arises where the extent of the work is uncertain. Applied to material cost the difference would be between the price of materials and the quantities needed. Price fluctuations were expected to be both smaller and more predictable than incurrence fluctuations as they tend to hinge on general economic conditions rather than behavioural or natural occurrences with a particular effect on a specific project. Procedures for predicting economic conditions and their effects are fairly well developed, and for the time period from first estimate to completion of a project effects are generally not of major size as against total cost. Incurrence fluctuations, on the other hand, can arise from virtually unpredictable occurrences – Acts of God, disease, or accidents – and are more likely to be of major import. It is unpredictable that a finished equipment should be dropped the first time it leaves the factory, and involved in a road accident the second, as happened with one firm studied.

(v) Estimators tend to present the most likely cost of a project.

By presenting the cost which has the highest probability of occurring an estimator would present estimates that correspond with actual cost on more occasions than if he used any other approach. Exhibit 1 shows a most likely cost of £550,000 for the project concerned, as against the expected cost of £609,500. In

calculating a most likely cost the probability of any item of cost arising is not weighted by the magnitude of that cost. Consequently the mean variation of estimated cost from actual cost over a range of projects is likely to be greater than if expected costs were used.

Simplicity of preparation, sparse references to expected cost concepts in estimating literature, and limited time available for the preparation of cost estimates all tend to reduce the probability that most likely cost will be arrived at in practice. This could happen if estimators employ standard rates based on most likely costs for any cost element. Some cost accounting texts, for example, suggest the use of standard rates based on 'normal' operation.² Rates based on time studies made after an operation has settled down, eliminating debugging and exceptional costs, are common. Because costs have no upper limit yet cannot fall below a minimum needed to complete the work involved, any elimination of exceptional variations will produce a downward deviation from expected cost. The distribution of potential cost outcomes, in other words, is skewed with a long right hand tail. Overhead rates, moreover, tend to magnify any tendency to produce most likely costs when they are recovered at a rate based on direct cost estimates that exclude exceptional variations. Overhead rates themselves also tend to be based on normal expense levels.

(vi) Contingency allowances have a high positive correlation with the size of the ascertainable cost of the project.

Preliminary examination of project cost estimates seemed to indicate that the larger the costs that could be specifically priced by the estimator (ascertainable cost), the larger the amount estimators included as a contingency allowance to cover risk and uncertainty. Where this is the case then contingency allowances do not reflect variations in the uncertainty as to the costs of a project. Instead they amount to an allowance for costs not ascertained at the time of estimating that are assumed to be more or less proportional to the size of the ascertainable costs.

(vii) The greater the number of people involved in the preparation of an estimate the greater the bias discernible.

Where estimates are checked and amended by others before use in final decision-making it is possible that the original estimate and the subsequent alterations will all be biased in the same direction of optimism or pessimism. If this occurs it would suggest the need for an alteration in the method of presenting estimates by including more detail in areas where bias is expected.

ted and showing the assumptions made by each person adjusting the estimate. It would be unusual if each individual's assessment of uncertainty were the same or even if they agreed how uncertainty should be quantified. But where uncertainty allowances are not very explicit it is possible that a general subjective view could be built up from indicators outside the figures and this used to adjust estimates at successive screenings.

Cases studied

Eight business units in the United Kingdom capital goods field were covered by the research, each allowing full access to records and estimators. The firms were all among the largest in their industries and included a cross-section of industries engaged in large contracts – engineering, electronics and construction. Within these units there were a total of 103 estimators, and 913 estimates prepared over the last five years by 68 of these estimators were examined.

The total accumulated cost of the 913 estimates was over £30 million with the sizes of individual estimates varying from £1.5 million downwards. The average size of estimate studied was smaller for each firm than for all its estimates. This simplified the collection of the data. Care was taken, however, to avoid an unrepresentative sample of a firm's estimating practices.

There was no pretence of attempting a fully representative sample of United Kingdom practice. The coverage was wide enough to provide a strong indication of the practice of a large range of firms. If from this selection the findings pointed towards changes in practice that would improve the treatment of uncertainty such changes would be well justified without expanding the sample.

Study results

It had been expected that the percentage of estimates using a single lump sum contingency allowance would be high, as indicated in the first hypothesis. Of 913 estimates, however, single lump sum allowances were used in only 80, just 9 per cent. But Exhibit 2 shows that 82 per cent included some form of lump sum allowance added to individual cost elements or subsections of the estimate. For example, the total labour content would be estimated and then 5 per cent contingency added, and perhaps 10 per cent added to the material content.

When testing the hypothesis that probabilities of uncertain events would not be widely used in estimating, some difficulty was experienced in deciding what to take as evidence of an estimator using probabilities. It was decided to adopt as a definition

Exhibit 2

Use of lump sum allowances

	<i>No. of estimates</i>	<i>%</i>
Overall lump sum allowance alone	80	9
Overall lump sum allowance plus lump sum allowances for specific elements or subsections of cost	486	53
Lump sum allowances for specific elements or subsections of cost alone	187	20
No lump sum allowance	160	18
Total:	913	100%

that probabilities were being used only where there was recorded evidence that a probability had been applied to a cost or an event.

Throughout the entire research in the eight major participating units no probability was seen written down in any estimate or its supporting working papers.

It is possible, although most unlikely, that probabilities could be used sensibly without recorded calculations. Verbal comments that some estimators were applying subjective probabilities to their work were made to the researchers together with comments that potential application of probability concepts, including expected cost calculation, were understood. But even in these cases no written record of probability calculations could be traced.

The third hypothesis proposed that there would be some provision for uncertainty built into cost estimates before a contingency allowance was added. In fact it has already been shown that the majority of estimates did not contain a single lump sum allowance but rather a series of allowances. The estimates for the cost elements or project subsections before making these lump sum assessments, however, must either have included the barest minimum cost for completing the project, or have included some allowance for uncertainty.

It was found impossible to trace from the estimates what allowances had been built in. A specified number of hours allowed for performing an operation, for example, did not disclose what the estimator had allowed over and above the minimum necessary under ideal conditions. Some estimators used standard rates alone, the majority made their own subjective adjustments. It was even difficult to discover what allowances were included in standard rates – frequently issued with apparent authority a considerable time earlier. There was a surprising absence of data showing how most of the rates in use had been arrived at. And it was impossible to discover on what basis estimators formed their judgements as to the

adjustments needed. While the estimators seemed to feel they received adequate feedback, five of the eight firms studied had no procedure for regular comparison of actual costs with estimates. Only a small percentage of the completed contracts studied had actual costs broken down by the headings used in preparing estimates.

Given the difficulties in tracing the level of allowances, estimators were asked directly whether any provision for costs in excess of the minimum were included under material and labour headings for each estimate. These are tabulated in Exhibit 3. In effect all labour estimates included some allowance but materials and subcontract work were frequently included at a firm price.

Exhibit 3

Provision for uncertainty in ascertained costs

	Material (No. of estimates)	Labour (No. of estimates)
Provision for uncertainty before any lump sum contingency allowances	488	793
No such provision for uncertainty	275	—
Unidentified	150	120
	913	913

Hypothesis (iv) anticipated that estimators would specifically quantify price uncertainty on many more occasions than incurrence uncertainty. In testing this hypothesis, examination was again confined to two cost elements – labour and materials. For price uncertainty the labour rates and raw materials prices were examined, and for incurrence uncertainty the labour hours and material usage. Exhibit 4 sets out the evidence obtained. While limited, it shows that estimators specifically quantified incurrence uncertainty more often than price uncertainty – the opposite of what was expected. In many of the estimates studied, the estimator did not attempt to quantify or allow for changes in material prices because changes were automatically adjusted in the contract price under standard contract conditions. This also applied to labour rates. Furthermore, no allowance for price uncertainty was seen necessary for contracts with a short lead time and production duration. Increases were apparently expected to give a longer warning period.

Not only were estimators expected initially to quantify price uncertainty more often but also to be more accurate in their quantification of price uncertainties. This was tested by comparing actual costs against their estimates. But there were a variety of reasons why it was not possible to make the com-

Exhibit 4

Price and incurrence uncertainty

	Price uncertainty (No. of estimates)	Incurrence uncertainty (No. of estimates)
Allowance for any uncertainty in:		
Labour	220	840
Material	463	840
Other costs	293	840
No allowance for uncertainty	—	57
Unidentified	107	16
(Total in sample: 913 estimates)		

parison for most estimates: specification changes, unsuccessful tenders, actual costs not collected, and uncompleted work at the time of research. For the 137 estimates in which it was possible to make an adequate comparison the ratio of actual cost to estimated cost was 103 per cent for price uncertainties, as against 115 per cent for incurrence uncertainties. While these measurements seem to support the expectation that price uncertainty was handled with greater accuracy, it must be remembered that orders obtained are likely to include more of those underestimated than those overestimated.⁵ The ratio of actual cost to estimated cost could be substantially above 100 per cent even where the means would have coincided had all tenders resulted in orders.

Because of these difficulties in interpreting variation between actual and estimated costs the investigation to ascertain whether estimators were tending to present a most likely cost instead of an expected cost was again limited to labour and material estimates. But the absence of data showing how rates had been arrived at hampered this line of questioning just as it did for finding what allowances for uncertainty were included. Detailed questioning of estimators as to the way they used the rates and what they felt they covered, resulted in only one useful generalisation: no estimate could be identified among those studied that did not include at least one element in its wages or materials build-up that was calculated on a most likely cost basis. Overhead, moreover, was usually apportioned on the basis of direct labour hours or direct labour cost and magnified any tendency towards most likely cost introduced in the labour cost calculations.

When an estimate includes elements based on most likely cost, it becomes difficult to specify with any accuracy what allowances would bring it up to an expected cost. And it is equally difficult to make useful comparison of actual costs against estimates. Even if the difficulties are overcome of adjusting for changes in the work actually carried out and for the

bias introduced by higher success in obtaining orders when costs are under-estimated, there still remains the question of what relationship the actual cost should bear to an estimate compiled with some elements included at a 'most likely' level and with some subjective allowances for uncertainty. There may be a significant bias one way or another that affects managements' pricing decisions, but cannot be identified. An attempt to produce an estimate conforming to one specified cost concept throughout would simplify the comparison.

These comments are reinforced by the results from testing hypothesis vi. There was a strong indication that contingencies reflected estimators' utilities – not expected cost. Contingency allowances (overall and specific) calculated as a percentage of ascertainable costs showed a positive correlation (0.62) with the level of ascertainable costs. This coefficient indicates that either risks increased more than proportionately with size of project, or, more likely, that estimators have a non-linear utility and were expressing it in their contingency estimates. In other words, where uncertain costs are of greater size estimators give them more than proportionate weight. Thus the larger the estimated ascertainable costs the more likely it is the percentage for contingency allowance will be larger, as shown in Exhibit 5.

Exhibit 5

Contingency allowances and project size

Estimated ascertainable costs of project	No. of estimates	Mean % contingency allowance
£		
0– 5,000	45	8
5– 10,000	38	8
10– 15,000	190	9
15– 20,000	99	10
20–100,000	184	12
over 100,000	33	14
	589	

It is possible that a high correlation coefficient could have been produced through grouping firms with different mean contingency levels and different distributions of project size. A breakdown of mean percentage contingency allowances by size of project and by individual firm, however, shows in Exhibit 6 that the pattern was almost universal. Only two units, B and G, show decreases in mean percentage contingency allowances for larger projects, and these are not very significant decreases. The large change in unit E's pattern of contingency allowances was due to subcontracting work for certain products at fixed prices.

Exhibit 6

Contingency allowances for individual units

Estimated ascertainable costs of project	Mean % contingency allowance unit:							
	A	B	C	D	E	F	G	H
0– 5,000	11	—	8	8	—	—	6	7
5– 10,000	8	9	10	10	—	—	6	9
10– 15,000	8	11	10	10	4	10	11	11
15– 20,000	10	11	10	12	6	11	12	11
20–100,000	11	10	14	13	12	12	11	12
over 100,000	—	—	—	15	14	—	—	12

In the majority of cases estimates were seen to pass through a number of screening stages before final use. They were frequently changed or amended. Details in Exhibit 7 record the changes which could be traced from the estimates and subsidiary records. There may have been additional changes, however, which were not recorded on these documents. Often the estimating process was one of continual exchange of views among estimators and departmental heads on difficult points or problem areas. The changes that were traced were also frequently of minor importance in relation to the total estimated cost of the project. Nevertheless, the extent and the pattern of changes

Exhibit 7

Changes in contingency allowances

No. of persons making successive changes to an estimate	No. of estimates in which changes were:			
	All increases	All decreases	Both increases and decreases	Total
1	23	6	—	29
2	102	23	35	160
3	12	1	81	94
4	5	—	7	12
5	1	—	1	2
	143	30	124	297
Could not trace any change				616
				913

should be of major concern. There are biases towards increases and towards cumulative changes in the one direction. It also seemed to be the case that original estimators are seldom asked to comment on their estimates at the point of use. More attention to common practices for quantifying uncertainty and recording the assessment would certainly limit the chance for considerable bias that appears to exist.

Implications of the findings

The picture to emerge from the findings was thus one of a mixture of provisions and contingencies – built

against no clear cost concept and checked against actual costs most imprecisely, if at all. Estimates emerged with a mixture of multiple lump sum contingencies, cost rates built on past averages, unspecified and subjective allowances for variations in ascertainable costs, inclusion of some price uncertainty but more incurrence uncertainty, and with greater contingency allowances for larger size projects. Moreover, there was no traceable use of probabilities in building the estimates. This lack of precision in estimating frequently made unnecessary a great deal of careful engineering calculation of requirements and tolerances carried out beforehand to provide the basic data for the estimates.

Two things in particular prevented this research from measuring the extent of deviations from expected cost by comparing actual costs against estimates: the lack of adequate figures for both estimates and actual costs, and the difficulty in allowing for the relationship between accuracy of estimates and success in obtaining the work. Nevertheless, all the evidence points towards significant deviations from expected cost. The very lack of adequate figures suggests that if expected cost is approximated it may only be accidental. And the figures that were obtained on contingency allowances and ascertainable costs suggest that contingencies include an expression of estimator utility that is biased against larger risks. Successive screening probably serves to increase these.

During the course of the study it became evident that many estimators regarded themselves as in a specialist function in its own right with specialist skills not to be claimed by either engineers or accountants. Yet apparently little attention is given to formal training of industrial estimators. Their skills – or rituals – were largely ‘picked up’ on the job. And many of these are worthy of the tag of measurement without theory.

A suggested alternative

While the art cannot be removed completely from estimating, clear specification of subjective assessments in estimates can minimise the chances of error. When the weightings placed on possible cost outcomes must be clearly recorded for others to see and perhaps justified, there is an incentive to prepare these parts of the estimate more carefully. There is less likelihood of those using an estimate building in a bias of their own because the subjective assessment already included was not apparent. And there is less likelihood of a succession of executives making a cumulative series of ‘amendments’ to the estimate. Whatever the decision maker’s feelings about risk, moreover, he will be in a better position to take them into account when

estimates show the possible cost outcomes and not simple single figure estimates. Finally, when expectations are shown clearly, comparison of actual costs against estimates can be made with much greater precision.

The suggestion, then, is that estimates should show separately and clearly the allowances for uncertainty that have been incorporated. One way of doing this is to prepare all estimates to show a *basic cost* then to add an expected cost for those elements that might vary from basic cost. Basic cost might be set at minimum cost under ideal conditions, at cost using standard rates which approximate a most likely cost, or at any other convenient datum point. If minimum cost under ideal conditions is taken as the datum, then provision need be made for upward variation only. On the other hand, if basic cost is calculated from standard rates incorporating, for example, an allowance for 5 per cent deviation up or down, then calculation of the expected cost allowance could be limited to cost variations in excess of 5 per cent from standard.

The calculation of the expected cost of deviation from basic cost might be based on information presented in a format such as that shown in Exhibit 8. The extent to which elements should be shown separately will depend on the amounts involved and the sensitivity of decisions to refinements, together with the ways in which cost records are kept and variations predicted. As shown, there would usually be an allowance for unascertainable costs. These represent costs which for one reason or another are not ascertained in preparing an estimate. They are not simply upward variations of costs estimated under the ascertainable headings. They are likely to vary around a predictable percentage of ascertainable costs, dependent on the knowledge of project details at the time of the estimate.

Using such a tabulation, the calculation of expected cost is not difficult. It is the summation of expected variations added to basic cost.

As we have already pointed out, however, the dispersion of possible costs may be as important to the decision maker. A probability distribution of possible costs is likely to be skewed around expected cost, with the most likely cost falling below and with small probabilities of exceeding the expected cost by considerable amounts. This shape of probability distribution arises because there is a minimum cost to carry out an order even under ideal conditions and a high probability that at least some of the costs will exceed this minimum. At the other extreme it becomes decreasingly likely that everything will go wrong at the same time.

If it can be assumed that cost variations will be independent of each other, then the dispersion of

Exhibit 8**Possible cost variations from basic cost****Summary assessment**

Project _____ Section _____

Cost element	Variation from basic cost							Total
Labour rates								
Extent of variation								
Probability of variation								
Expected variation								£
Labour productivity								
Extent of variation								
Probability of variation								
Expected variation								£
Weather delays								
Industrial disturbances								
Material usage								
Material price, etc.								
Contingency: unascertained costs								
Extent of variation								
Probability of variation								
Expected variation								£
Total								£

possible costs can be arrived at directly from the information set out in Exhibit 8. The probability of any combination of cost outcomes from the different variation headings is the product of their individual probabilities. The number of possible combinations is large but a simple computer program can be used to calculate their probabilities. Alternatively, an approximation using the properties of the binomial distribution could be devised. Where outcomes are not independent the calculation would become more complicated. Most costs, however, can be regarded as independent. Weather conditions, labour unrest, accidents, and material prices, for example, are not likely to be highly correlated.

There will undoubtedly be many difficulties in introducing any approach of this nature, and care would be needed to avoid double counting or other inconsistencies. But these are really beside the point. Uncertainty is being treated so roughly in practice that any attempt, however incomplete, to specify the

concepts and expectations involved in its calculation would be a considerable improvement. At the moment some contingency allowances appear little more than mumbo-jumbo. A corollary to this is that the urgent need for accounting research is to concentrate more on the practical problems of measurement. Ever more polished papers refining the concepts of uncertainty leave the real problem untouched.

References

- ¹ Russell M. Barefield, 'Comments on a Measure of Forecasting Performance', *Journal of Accounting Research*, Fall 1969, pp. 324-7.
- ² Robert I. Dickey, *Accountants' Cost Handbook*, The Ronald Press Co, New York 1960, pp. 13-14.
- ³ John W. Hackney, *Control and Management of Capital Projects*, John Wiley & Sons, Inc, New York 1965.
- ⁴ Charles T. Horngren, *Cost Accounting*, Prentice-Hall Inc, Englewood Cliffs, NJ 1967, Chapter 26.
- ⁵ Robert Schlaifer, *Probability and Statistics for Business Decisions*, McGraw-Hill Book Company, Inc, New York 1959.
- ⁶ Kenneth Simmonds, *Adjusting Bias in Cost Estimates*, *Operational Research Quarterly*, Vol. 19, No. 3, pp. 325-7.

Accounting Research in the United States

A Survey of Current Organisational Activity*

David Solomon†

The reaction of most laymen, when they hear for the first time that a good deal of research activity goes on in the accounting world, is one of surprise that such a practical subject provides scope for research at all. There is probably a good deal of ignorance, even among many accountants themselves, as to the range and nature of the work that is going on. A survey of the research activity of the four principal organisations of accountants in the United States at the present time will serve to illuminate the scene. What follows does not by any means cover the whole of American accounting research, for it does not include any projects under way at academic institutions or in professional firms other than those which are being sponsored by one of the four bodies in this survey.

The four organisations in question are the American Institute of Certified Public Accountants, the American Accounting Association, the National Association of Accountants, and the Financial Executives Institute. Some introductory remarks contrasting the approach to research of the first two of these bodies may not be out of place.

The AICPA's research activities are and have been in recent years closely geared to the needs of the Accounting Principles Board. Even if the suggestion made by Mr Robert Trueblood at the AAA's 1969 Convention, that the composition of the Accounting Principles Board should be drastically changed, converting it from a somewhat large group of part-time members whose principal activities lie elsewhere to a smaller full-time Board, were ever implemented, it is unlikely that the role of the Institute's Research Department would be drastically changed. It is likely to continue to concern itself with those problems on which the Board thinks that a pronouncement should

be made. Thus the Institute's Research Department is concerned exclusively with problems of financial reporting. Management accounting problems do not appear in its list of on-going research projects. This situation could change in the next few years if the proposals for a more ambitious research programme put forward by the Institute's Planning Committee are implemented. ' . . . research in accounting principles is [not] the only area under consideration. The planning committee has in mind a programme of much broader scope, intended to serve all Institute members, whether in large or small firms, teaching, industry or government. This is not to minimise the importance of accounting principles to all members of the profession. It means only that the committee believes other areas to be of equal importance to some members of the profession. Doubtless a substantial proportion of resources available for research will continue to be devoted to accounting principles for years to come. It seems high time, however, to begin research in other fields that it might prove dangerous to neglect.'¹

There is an important difference between the approach of the AAA to research and that of the other accounting bodies in the United States. The AAA alone has no paid research staff. Indeed, the only money which it spends on research is in the form of the very modest research stipends and grants towards expenses which it offers to researchers who are working under its sponsorship. These projects are for the most part proposed to the Association by the researcher. In the early stage of its research programme the Association did formulate research proposals and then commissioned individuals to work on them. But at that time it had no funds with which to finance these projects even to the modest extent that it now does. It is not surprising, therefore, that these early projects did not flourish. The results

* A paper delivered to the Accounting Educators Conference sponsored by the Western Canada Chartered Accountants' Course of Instruction at Banff, Alberta in April 1970.

† The author was Director of Research of the American Accounting Association, 1968-70.

¹ Justin Davidson, 'Research in Accounting,' *Journal of Accountancy*, September 1968, pp. 44-5.

of the research projects which it is able to support are published in the *Research Monograph Series*. These projects by no means constitute the whole of the Association's contribution to accounting research, and perhaps not even the most important part of it. Two other contributions must be added. The Monograph Series offers an outlet for work which it might be quite difficult to have published elsewhere, either because it is too long for an article and too short for a book; or because it is likely to appeal to a very restricted audience. The Association's other contribution to research, which consumes vast numbers of unpaid manhours, is made through its committee structure. Each year the President-elect sets up a number of committees to work during his year of office. With the advice and consent of the Executive Committee, he defines the charges to these committees and appoints members to them. The reports of the committees are published in a special supplement to *The Accounting Review*. Some members of the Association, and indeed of the Executive, think that this method of publication does not give sufficient visibility to what are often valuable contributions to accounting thought. Reference will be made later to the activities of several of these committees.

It was stated above that the AICPA's research activities are closely geared to the needs of the Accounting Principles Board. This is not to say that the Research Department is only concerned with various specific topics, like the treatment of goodwill or poolings of interests. Accounting Research Studies Nos. 1 *The Basic Postulates of Accountancy* by Maurice Moonitz and 3 *A Tentative Set of Broad Accounting Principles for Business Enterprises* by Robert T. Sprouse and Maurice Moonitz were certainly not narrow or highly specific but, their reception from the accounting profession in the United States was such that it seems unlikely that the Institute will again in the near future sponsor wide-ranging inquiries of that kind.² The contrast between Accounting Research Study No. 3 and Study No. 7, *The Inventory of Generally Accepted Accounting Principles for Business Enterprises* by Paul Grady, published in 1965, is dramatic and significant. As long ago as October 1966, Dr Reed Storey, the Institute's Research Director, and his associate, Leonard Lorenson, reported in the *Canadian Chartered Accountant* that work was proceeding on an attempt to reconcile matters presented in Studies 1, 3 and 7. A lengthy statement of *Basic Concepts and Accounting Principles Underlying Financial Statements of Business Enterprises* has been circulating for

some time, and it has been reviewed by a task force set up for this purpose by the President of the American Accounting Association. No doubt it has been reviewed by many other persons, as well. It seems likely that it will be issued as a statement by the Accounting Principles Board shortly. It may be expected to bear a much closer resemblance to Accounting Research Study No. 7 than to Study No. 3.

Other research studies which the AIPCA has had in the works for a long time are studies concerned with intercorporate investments and with stockholders' equity. These have both been worked on by the Institute's own research staff. Another study, the report on which is now circulating in draft form, is concerned with accounting for research and development expenditures. It will, I understand, seek to find methods of accounting for these expenditures which will permit of a greater degree of uniformity as between one company and another while admitting a recognition of the capital nature of much R & D expenditure without, at the same time, sacrificing too much in the way of objectivity. Studies of inventory pricing and of depreciation methods are also in an advanced stage. On the other hand, a study of the concept of materiality, and another which is concerned with accounting for working capital, are still at an early stage of development.

Looking down the list of those responsible for the research studies listed by the Institute, one cannot help noting a change in the character of those to whom the Institute is looking for its research work. The earlier research studies were largely the work of academics. On the current list the authors are drawn predominantly from the large national firms of CPAs, though it is fair to add that some of the practitioners involved in this work were formerly themselves academics. It looks as though the Institute is now more anxious to keep its feet on the ground.

Yet the Institute also lists as being in the preliminary research stage a more fundamental study entitled 'Asset and Liability Valuation and Periodic Income Measurement'. This study is being conducted by the Institute's own research staff. It is still a very early stage and is, perhaps, several years away from publication. I mention this rather to make the point that Institute research is not all of a purely ad hoc nature. And this is fortunate, for no other body in the United States has anything like the prestige of the Accounting Principles Board, or its power to effect financial reporting practices – except, of course, the SEC – and this might be expected to inhibit other accounting bodies from working in this field. In the longer run, it will not be surprising if the other bodies do withdraw more and more from this area of research, unless proposals now being mooted to broaden

² But see George A. Gustafson, 'Study of ARS, Nos. 1 and 3,' *Journal of Accounting*, March 1970, pp. 56–60, on the contribution of these studies to other APB opinions.

the Board's base are implemented. As yet the other bodies have not ceded the field entirely to AICPA. The NAA lists a study on interim financial reporting, which will cover reporting both to management and to outsiders. The Financial Executives Institute will embark shortly on an ambitious study of uniformity in financial reporting. This project is sufficiently interesting to warrant some brief discussion of its own.

For the FEI's project on uniformity and comparability in financial reporting, the principal investigator will be R. K. Mautz, who carried out the Institute's project on reporting by diversified companies. The study, it appears, will be concerned not only with the nature of uniformity and comparability, but will also endeavour to investigate situations in which departures from uniformity have been considered justified by the companies concerned. The research method will consist of the collection of a number of case studies of situations where there have been deviations or departures from generally accepted accounting principles. It is hoped that if a sufficiently large number of cases can be obtained and studied, then patterns may emerge which will help the researchers to identify circumstances which might constitute 'legitimate reasons for non-uniformity'. This could be a particularly valuable study, for by examining the reasons which have caused companies to depart from generally accepted accounting principles, it could throw light not only on the nature of uniformity, but also on the dangers of exacting too high a price for it. It could provide a useful complement and corrective to the work of the AICPA in securing greater uniformity in reporting.

Other projects in the area of financial reporting are being conducted by the NAA and the Financial Executives. The NAA is following up its earlier study of financial reporting by diversified companies by collecting case studies to test the implementation of the reporting methods proposed in that study. The Financial Executives are embarking on an ambitious project which at the moment is called 'Fair Value Reporting'.

What this means is reporting on a basis of current value rather than historical cost. This still leaves a wide choice of different ways of defining current value. The research plan is 'designed to test the usefulness of value accounting by studying the decision processes of report users (bank credit files, security analysts' reports, company experiences) with these decisions' makers. The practicality of implementation by studies of companies that use or have used these techniques and by feedback from corporate managements will then be ascertained.' The relationship between this project and the AICPA's long-range study of asset valuation and income measurement is apparent.

It is worth noting that the AAA is to have a committee working in 1970-71 in this area to be called the Committee on Accounting Valuation Bases. The charge to this committee is to define the parameters and usefulness of valuation bases in accounting in the light of existing theoretical studies, to identify a model by which these parameters could be applied to real world situations, and to test the application of this model in one or more case studies. Previous theory studies of the AAA are to form the bases for this report. Though historical cost seems to be in no immediate danger of being superseded as the principal basis of financial reporting, it is a cause for satisfaction that its alternatives are not being wholly neglected.

The AAA also has a committee on financial reporting, and it has taken as its task the identification of problem areas, a problem area being considered to be any area where current reporting practice does not fairly reflect the underlying economic activity. The committee thinks that it should try to keep ahead of the APB, instead of merely criticising the APB after the fact. The list of topics which appears in the committee's inventory of problem areas does not, as a matter of fact, make it look as though the committee is far ahead of the APB. Indeed, the list looks more like the APB's agenda for the last few years. It includes such items as earnings per share and convertible securities, accounting changes, funds statements, marketable securities, revenue recognition, leases and other long-term contractual arrangements, business combinations, intercorporate investments and foreign investments, deferred taxes and investment credit, and price level adjustments. These, then, are what the committee considers to be the problem areas in the field of financial reporting at the present time.

This does not quite exhaust the work which is going on in the financial reporting field. The AAA has a study on the nature and measurement of goodwill. This involves an examination by questionnaire and interview of methods used by companies in handling goodwill. The Financial Executives also have a short-term project concerned with pooling of interests accounting. Besides the usual literature search and interviews with accountants, analysts, corporate executives, and others to find out systematically what they think the benefits and disadvantages of pooling accounting are, there will be an examination of all business combinations reported in a year to find out how they were accounted for, 'their impact upon reported earnings and earnings per share under the method used as contrasted with other possible methods, and the comparison of the results of the various accounting methods with criteria for meaningful reporting established in the initial part of the

research work'. A more extensive study of the problem of accounting for business combinations is expected to follow this shorter-run study of pooling.

An interesting empirical study of the usefulness of financial statement information is being supported by the AAA and is now under way. The principal investigators are Professors Pankoff and Virgil, of Washington University, St Louis. Specifically they say, 'we want to discover the relative value to a prominent user, the investor, of the various kinds of routinely calculated financial statement numbers, such as sales and net income, relative to each other and to some other kinds of quantitative information'.

Usefulness is defined here to mean the extent to which information facilitates decision making. The approach of Pankoff and Virgil is to use a laboratory experiment. They select a group of investors and financial analysts who are asked to make portfolio decisions over several time periods. Instead of providing their subjects with a whole collection of financial information about the firms in the simulated market in which they are to invest, the subjects are given the opportunity to purchase information. From the frequency of purchase of different kinds of information, it is hoped to get a measure of the relative usefulness of this information. The firms in which the subjects may invest are three real firms, though their names and industry are not disclosed to the subjects. Information about each firm's closing market price and cash dividend rate is given automatically at the end of each period and for three historical periods at the beginning of the experiment. 'To learn more about the firms at the start of each period subjects may purchase one, two, or three periods of information for any of 35 available information items.' These 35 items are made up of four items relating to general economic conditions, seven relating to conditions in the industry, and 24 relating to the specific company. Incidentally, the accounting items are restricted to ones using generally accepted accounting concepts. However, the experiment could easily be adapted to investigate the usefulness of concepts which are not yet generally in use, such as current cost in contrast to historical cost information. The price of the information is set at the beginning of the experiment at \$30 per item per period. This price increases or decreases by \$2 each period, depending on whether the individual subject ordered the item in the prior period.

In view of the interest in the US in international operations at the present time, it is not surprising to find that all four organisations, AICPA, NAA, Financial Executives, and the AAA, have projects of a distinctively international character. The AICPA has two. One which is well advanced, having been started several years ago, is concerned with the cur-

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rency translation problem, and a publication on this subject may be expected fairly soon. There is also a longer-range project entitled 'World-Wide Financial Reporting to Investors'. However, there seems to be some question as to whether this project will be proceeded with. The Financial Executives' list includes a project entitled 'Financial Control of Multi-National Operations'. 'This study will describe the successful financial management techniques currently used by American companies to control their operations in other countries. It will suggest and develop new financial control techniques for this purpose and evolve practical principles of financial management of multi-national companies.' The NAA has a project which sounds remarkably similar. It is called 'Financial Control for International Operations'. Its objective 'will be to analyse financial information needs, financial data available, and problems arising in utilising these data to make decisions for planning, appraising, and controlling international operations by US companies'. The AAA's committee on international accounting during the past year has been compiling a handbook of information which it is hoped will be of value to researchers in the international accounting field.

In the more or less traditional areas of management accounting, the NAA is revising its earlier studies on the use of standard costing in industry and also its studies on the analysis of cost-volume-profit relationships. Another of its studies is concerned with contribution margin analysis for managerial decision making. 'The study will restate the economic theory of marginal analysis in specific terms relevant to major categories of management decisions and it will describe and relate to these decisions the techniques for measuring incremental costs and revenues.' Two bodies, the NAA and the AAA, are showing interest in the marketing area. The NAA has a project called 'Identifying the Information Needs of Marketing Management'. The project description states that emphasis will be placed on discovering advances in information reporting made possible by modern computer applications. The AAA's list of committees for 1970-71 includes a committee on cost and profitability analyses for marketing. The charge to this committee is 'to prepare a report setting forth appropriate cost and revenue concepts and reporting techniques for planning, control, and decision making in marketing including physical distribution systems, which may encompass the totality of production and marketing'.

Perhaps in this area of traditional management accounting we might also place the NAA's project on 'Cost Concepts for Government Contract Pricing'. The General Accounting Office in the United States

recently reported on this matter.³ While accepting the feasibility of establishing cost accounting standards for use in procurement contracts, it rejected the idea that uniform prescribed methods of computing costs could be developed to cover a wide variety of situations and circumstances. The AICPA is supporting a research team at Stanford to work in this area, and their interim report, 'Cost Concepts and Implementation Criteria', appeared in 1969.⁴

Something new in the way of research support is represented by a new project which is just getting under way with the joint sponsorship of the AICPA and 11 large CPA firms in the United States. The project is concerned with the causes of professional staff turnover in public accounting firms, and the three principal investigators are university professors with combined skills in accounting and behavioural science. Besides determining the causes of turnover among the staffs in public accounting, it is hoped to develop techniques to predict which individuals are likely to leave public accounting positions, to explain why accounting students select one firm rather than another, and to examine the personality and vocational interest differences of the sample group. The critical hypothesis that will be examined as to its validity is that individuals who leave public accounting do so because their job and career expectations are unfulfilled. The principal research instrument will be a questionnaire administered to a randomly selected group of 800 holders of Bachelor's degrees and 200 holders of Master's degrees entering the accounting profession. An expectancy questionnaire will be administered both before and after students have had contact with CPA firm recruiters. Then, to note changes in expectations over time, the questionnaire will again be administered to each subject at the end of his first, second, and third years of professional experience. The investigation may have to continue for more than three years if statistically significant numbers of subjects have not left the profession by the end of three years. While the main benefits from this inquiry may be expected to accrue to firms in the accounting profession who bear the cost of high labour turnover, some benefits should certainly also accrue to educational institutions, since the inquiry may reveal that false expectations about professional prospects are being inculcated in their students. Incidentally, the Financial Executives' Institute has a project which might be appropriately

mentioned at this point. It is concerned with the development of financial managers. The study will determine the educational background, the experience and training after employment, and the personal characteristics which are required to make a competent financial executive.

Turning now to less traditional areas, both the NAA and the AAA are showing an interest in systems. The NAA's project is entitled 'Planning and Control of Computer Based Systems for Management'. It is concerned with such practical problems as systems project planning, project justification, project monitoring and control, computer room management, controlling systems cost, and methods of charging users for service. The AAA's project is entitled 'Towards A Theory of Management Information Systems (An Organisational Behaviour Approach)'. This project will start with a review and summary of significant recent empirical research findings in organisation theory, to extract and analyse their implications for management information systems. Thus it might be expected that a manager's information requirements would be different according as his functions were task-oriented, whether his time horizon was long-term or short-term, whether he was part of a formal or informal structure, and so on. From the set of relationships linking organisational variables with information uses, it is hoped that part at least of a theory of management information systems may emerge. The Association also has a committee on information systems. It was asked to 'search out developments in information and communication theory; evaluate the relationship of these developments to accounting theory; and to examine data processing methods toward the objective of broadening and refining the accounting information systems'. This committee has maintained close relations with another committee of the Association which is concerned with the role of the computer in accounting education. Reports from both of these committees may be expected before the end of 1970. The charge of the committee on information systems for 1970-71 will be somewhat different, for it is being asked 'to assess the developments that are likely to occur over the next ten years that will have a significant impact on the design and operation of information systems and to develop a report that addresses the following questions. (A) What will be the role of the fiscal administrator in providing information for decision making? (B) What technological innovations are forthcoming to facilitate the processing and reporting of information? (C) What are the educational implications of these expected changes as they relate to formal programmes of accounting instruction? (D) What posture should the AAA take, what programmes

³ *Report on the Feasibility of Applying Uniform Cost Accounting Standards to Negotiated Defense Contracts* by the Comptroller General of the United States (US Government Printing Office, January 1970). For the main conclusions and recommendations see the *Journal of Accountancy*, March 1970, pp. 7-12.

⁴ AICPA, New York, 1969.

should it initiate, and what policies should it adopt to promote and support advancement in these areas?

One might expect the common ground between operations research and accounting to be the scene of greater activity than it currently is. Of course a great deal of work is going on in American universities, but it is the work of individuals rather than of organisations. The NAA alone of the bodies cited lists a project in this area. It is entitled 'Management Science Techniques for Planning and Budgeting'. The study will examine accomplishments and opportunities in the use of models in business planning. Though the AAA does not currently have any work going on precisely in this area, the volume of committee reports published as a supplement to Volume 44 of *The Accounting Review* does contain a useful report of the committee on managerial decision models which worked on this topic during 1968 and 1969.

The last area in which there seems to be any significant overlap between the research activities of the American accounting organisations is the area in which accounting and behavioural science meet.⁵ The NAA has plans for work in this area, though these plans have not yet been formulated in any detail. The AAA has had a committee working this year on the behavioural science content of the accounting curriculum. It is attempting to identify those areas of behavioural science which have relevance for the accountant. It is surveying the literature of social psychology, sociology, anthropology, administration, political science, management science, and organisation theory for this purpose. It recognises that truly to introduce behavioural science into the accounting curriculum will require more than merely reading what behavioural scientists have had to say. Simulations, case studies, and other more experimental methods will probably have to be used if this new element in the accounting curriculum is to be exploited fully. It is doubtful whether accountants will be able to exploit it effectively on their own. This looks like an area where joint work will be essential.

What new directions may accounting research be expected to take in the near future? One can distinguish between new areas of endeavour and new methods. As for new areas, some have already risen above the horizon – accounting for human resources, for example or, to use a *Harvard Business Review* title, 'Put People on Your Balance Sheet'.⁶ It is surely true that in neglecting to treat the development

of a firm's work force as an investment and by looking at the payroll merely as an expense, we have left out of our accounting an important dimension of the managerial problem. It does not seem to be beyond our capabilities to adapt our statements so as to recognise this missing dimension. Once we have done that, we may be able to recognise other missing dimensions such as, for example, the firm's market position, the social acceptability of its products, and of its managerial posture on such matters as pollution, racial discrimination, and the like. The limited concept of directors' stewardship is already being challenged by Ralph Nader and others in the United States.

These thoughts suggest another area of growing interest to accountants, namely, socio-economic accounting. This was the title of one of the AAA's 1969 committees. Perhaps this committee's report will tell us more about the nature of this subject. It is concerned with the accountant's contribution to the measurement of economic and social phenomena. Though the figures which accountants compile for private firms are an important input into the measurement of, say, gross national product, accountants have shown relatively little interest in the development of these statistical measures. Various kinds of social costs – the cost of pollution, the cost of crime, the cost of inadequate health services – are other measures which accountants might be expected to help develop. The training received by accountants has not been well adapted to equip them for these tasks. It may already be too late to take corrective action.

Turning from areas of research to methods, two trends which are already evident may be expected to become more important. One is the increasingly empirical nature of accounting research. Accounting researchers of the future may be expected to indulge in less arm-chair theorising and to be concerned much more with the ascertainment of facts either by experimentation or by other forms of observation. When one looks at some of the empirical studies which have been carried out so far, one is surprised to find out how many of them have not really been concerned with real-world situations. Questions which should have been put to businessmen and managers have been put to students in the classroom because they were more easily available. Managerial decisions which should have been observed under real working conditions have been simulated by gaming situations, where no important consequences to the player could be expected to result from his success or failure in the game. Research of this nature may be better than nothing; but it is only a first faltering step towards the real thing.

Side by side with this growth in empiricism, we

⁵ An article by Professor T. W. Macrae entitled *The Behavioural Critique of Accountancy* will appear in the second issue of *Accounting and Business Research*.

⁶ Article by James S. Hekimian and Curtis H. Jones, *Harvard Business Review*, January–February 1967, pp. 105–113.

may expect to see much more inter-disciplinary research than has been the case hitherto. Reference has already been made to the accountant's need for help in investigating the impact of accounting on human behaviour. The interplay of accounting and management science is another obvious area in which more than one skill is needed. Co-operation between ac-

countants and economists, accountants and sociologists, in the socio-economic area already referred to, provides further scope for joint activities. There is no need for accountants to apologise because they need help from other disciplines. What does call for apology, rather, is that they have been so slow to recognise this need.

Towards a new Measure and Use of Gearing

C. A. Westwick*

Introduction

A firm is said to possess gearing (or leverage in the USA) when it has capital that ranks before the ordinary shares for dividends or interest – with the result that the profit attributable to the ordinary shareholder tends to vary disproportionately to the total profit.

Gearing is of interest to the investor in ordinary shares, and to the Directors of a company in the exercise of their responsibilities towards the ordinary shareholder. The concept can be used to see what influence the choice of sources of finance has had on a firm's results in the past, and to forecast the effect of this choice on future performance.

It appears to be the general rule of writers on the subject to limit the concept of gearing to the effects of preference shares and debentures. This seems to be a rather narrow view, as there are other sources of finance which have a similar effect on the ordinary shareholders' profit. The first part of this article, therefore, contains suggestions for expanding the sources of finance included in the concept of gearing.

Many different ratios to measure gearing have been put forward by writers on the subject; some of these are outlined in Part 2. However, though they suggest a ratio to *measure* gearing (and use it to label a firm as having a high or low gearing), the majority of the authors do not *use* their ratio to calculate or analyse the effect of gearing. Instead they revert to the absolute figures and work out examples from them. This approach seems clumsy compared to the use of

ratios with their power of succinctly expressing key relationships. Furthermore, it seems uneconomical and a little illogical to calculate a ratio in order to measure gearing, and then not to use it for diagnosing or forecasting the gearing's effect.

In contrast to the majority, two authors do use their gearing ratios. The ways in which they do this are described in Part 3. These ways, however, appear to have limitations. Part 3, therefore, also contains suggestions for a new way of using either a traditional measure or the expanded concept of Part 1.

The effects of tax, and of the relation between holding companies and their subsidiaries are considered in the fourth section, whilst the availability of the information required to calculate the expanded measure of gearing (suggested in Part 1) is the subject of Part 5.

1. Expansion of the concept of gearing

The general rule followed by writers is to limit their definition of 'prior charges' to preference shares and debentures, and of 'interest paid' to preference dividends and debenture interest. This limitation probably stems from the long-term nature of those types of finance.

However, there are many other sources of finance which, although of a more short-term nature than preference shares and debentures, have two characteristics in common with them, namely that their 'interest', if any, has to be paid before there is any profit available for the ordinary shareholder, and that, once this interest has been paid, any profit derived from using the assets financed from these sources accrues to the common or ordinary (or deferred) shareholder.

Loans and bank overdrafts, and the interest on them, are obvious candidates for inclusion in an expanded definition. Trade and expense creditors are also possible candidates, though more debatable. Though each invoice sent by suppliers is paid after a

* I should like to express my thanks for the help which I have received from discussions with Professor W. T. Baxter, with H. Ingham, L. Taylor Harrington and W. J. H. Everitt (all colleagues when I was at the Centre for Interfirm Comparison) and with P. Helps, now at the University of Wisconsin.

A small part of this article first appeared in the *Journal of Accounting Research* (a joint publication of the University of Chicago and the London School of Economics) under the title 'A Graphical Treatment of Gearing', and I am grateful to the editor for his permission to reproduce it here.

relatively short period (usually a month or so) there is always (or nearly always) a pool of unpaid invoices. Part of this pool will be the result of suppliers' providing further goods before all their earlier invoices have been paid; part from the time-lag between delivery and payment. This pool amounts to a fairly constant source of finance, varying mainly with the level of business – a characteristic it often shares with a bank overdraft.

To some extent, trade and expense creditors provide their credit interest free. Where, however, discounts are given for prompt payment, one could argue that lost discounts should be included in interest cost. Whether any firms apply such a theory in their book-keeping is doubtful. But some firms do credit discounts actually received against interest paid.

The items shown in a balance sheet as a result of taxation have varied between the time prior to the introduction of corporation tax in Britain (1965/66); and the time after. If an analyst is going to look at a firm over the course of the previous 10 years (a fairly typical time scale) then he will need to consider both situations.

In both situations short-term tax provisions can be considered as a source of finance on the same ground as trade creditors.

Pre-Corporation Tax

Longer term tax reserves, which until the introduction of corporation tax were a feature of British balance sheets are however more of a problem. On the one hand, it can be argued (on the usual assumption of a continuing business) that these will be eventually paid to the tax authority and, until that time, are analogous to a loan from the government. On the other hand, if the business were to cease on the balance sheet date then the item might not become payable.

Because the assumption of a continuing business is, I consider, more realistic than that of a terminating one, and because a reserve for future tax will have to be paid to the Inland Revenue even if no further profit is made and therefore will have to be paid out of past profits as well as being based on them, I feel that, on balance, the weight of the argument comes down on the side of including tax reserves in prior charges. Care is needed, however, when comparing companies some of which have made tax reserves whilst others have not.

It is interesting to note that this conclusion receives indirect support from the *Economist*. In calculating the ratio of net equity earnings to net equity assets, this journal specifically excludes future tax reserves from net equity, which is limited to ordinary capital, capital and other revenue reserves (e.g. *The Economist*, 21 April 1962, p. 265).

Post Corporation Tax

The Institute of Chartered Accountants recommends (recommendation N27) that corporation tax be based on the profits shown by the accounts, and the amount unpaid shown in the balance sheet as a provision, not as a reserve. It also recommends that income tax may be included with creditors or debtors. Finally it suggests that a 'deferred taxation account' (representing corporation tax on the difference between the profits shown in the accounts and the amounts assessable in respect of the accounting period) should not be treated as a reserve nor included in current liabilities.

I suggest that income tax creditors, the provision for corporation tax, and the deferred taxation account should all be treated as medium-term loans (in some cases not repayable for 21 months) from the Government and be included in prior charges.

Investment grants are another form of loan from the Government. Although they may become repayable in some circumstances these are unusual. I suggest therefore (in line with the Institute's recommendation N24) that they be included initially in prior charges, but that as the assets they helped to acquire are written off, an amount equal to the depreciation be transferred to equity capital.

Balances payable under hire purchase agreements should also be included in our extended definition.

This concludes the sources of finance that are *shown in the balance sheet*. I should now like to take the argument a stage further, and to suggest that sources of finance not usually shown in the balance sheet should also be included in prior charges.

If one wants to acquire the use of an asset without using capital provided by ordinary shareholders, one can either borrow money with which to buy the asset or else *lease* the asset. Under the first method, there will be an addition to prior charges (and to assets), while under the second nothing additional will appear in the balance sheet. The two are, however, similar in their effects on the ordinary shareholder;¹ I feel, therefore that the value of hired, leased or rented assets should be included in prior charges, and that a suitable part of the 'rent' should be included in

¹ It is interesting to note the Jenkins committee expressing somewhat similar views in the following passage:

'It is becoming increasingly common for companies to sell their freehold properties and take them back on lease from the purchaser and to hire instead of buying machinery and plant. We think the shareholder should be told how much of the company's gross earnings are committed in this way to meet its obligations in respect of rent; *these obligations are economically the equivalent of depreciation and interest on debentures and other fixed loans* which are already required to be shown separately in the profit and loss account.' [*Report of the Company Law Committee*, Cmnd. 1749, HMSO, p. 149 (the italics are mine).]

interest paid.² An example of the accounting which would be required is given in Appendix 1.³

Another source of finance not shown in a firm's balance sheet is the factoring of book debts. I should like to include the amount of factored debts in prior charges, and the factoring company's charges in interest paid. Similarly, discounted bills receivable should be included in prior charges and discounting charges in interest paid.

Consideration should be given to measuring the *average* value, rather than the year-end value, of many of the suggested additions to prior charges. If one is either looking back over a firm's performance in the past or attempting to forecast its future, one is looking at performance *over a period*. It is therefore desirable that gearing should be an average for that period and not a point-in-time figure. This argument applies equally to the traditional measures. However, in their case, the average value and year-end value seldom differ.

Finally, to turn to the other part of the gearing ratio: equity capital should, I consider consist of paid-up ordinary shares, capital and revenue reserves, including the balance on the profit and loss account, but excluding tax reserves where appropriate.

The contents of this section may be summarised as follows:

<i>Prior charges</i>	<i>Interest paid</i>
<i>Traditional</i>	
1. Preference shares	1. Preference dividends
2. Debentures	2. Debenture interest
<i>Suggested additions</i>	
1. Loans	1. Loan interest
2. Bank overdraft	2. Interest on overdraft
3. Trade and expense creditors	3. Cash discounts not obtained
4. Corporation and/or income tax provisions	4. —
5. Incomes tax reserves and deferred taxation accounts	5. —
6. Part of investment grants	6. —
7. Balance outstanding on hire purchase agreements	7. Hire purchase interest
8. Part of the value of rented, hired or leased assets	8. Part of rent
9. Factored; debts	9. Factoring charge
10. Discounted bills	10. Bill discount

65.8.05
Ac 27

2. Existing methods of measurement

Although there is general agreement on what gearing is, there are several different ways of measuring it. These ways may be divided for convenience into two groups: the income method and the capital method. The former relates various profit figures to each other or to interest payments. The latter relates the various sources of capital one to another. The former measure the results of gearing; the latter the causes of it. Examples of the two methods follow:

2.1 *The capital method*⁴

- (a) Total capital/Equity capital (Rix)⁵
- (b) Prior charges/Total capital (Dowrie)⁶
- (c) Prior charges/Equity capital (Warren)⁷
- (d) Equity capital/Prior charges (Parkinson)⁸

In addition to these combinations of basic constituents (i.e. prior charges, equity capital, and total capital), various methods of valuing these constituents are also suggested, for example:

- (a) Prior charges and equity capital at nominal value (Rix & Parkinson)^{9, 10}
- (b) Equity capital at market value; prior charges at par (Rix)¹¹
- (c) Equity capital at nominal value plus reserves; prior charges at par (Rix)¹²
- (d) Prior charges and equity capital at the lower of book or market value (Dowrie)¹³

² Only part of the rental under a plant leasing contract should be included in interest paid, as a major part of the rental in the primary period is a repayment of the 'loan' from the finance house. A further adjustment might also be made during the secondary period when the rent is reduced to a nominal rate. Similarly, only the balance of the capital value after subtracting the repayment portion of the primary rental should be included in prior charges.

³ For a slightly different accounting method, involving discounting the future rental payments but assuming equal annual rental payments, see J. W. Bennet, J. Mc. B. Grant, and R. H. Parker, *Topics in Business Finance & Accounting*, F. W. Cheshire, Melbourne, 1964, p. 127 *et seq.*

⁴ Different authors use different words to describe the same thing. For example, Rix refers to prior charges whilst Dowrie uses the expression senior debt, and the NAA refer to assets where others would use the term net assets. To facilitate comparison of the methods described later, I have standardised the terminology as follows: prior charges equals preference shares and debentures; equity capital equals ordinary shares; total capital equals prior charges plus equity capital; interest paid equals interest and dividends paid to prior charges; total profit equals profit before deducting interest paid; and net profit equals total profit less interest paid.

⁵ M. S. Rix, *Investment Arithmetic*, Pitman, 1964, p. 143.

⁶ G. W. Dowrie, D. R. Fuller, F. J. Calkins, *Investments*, Third Edition, John Wiley, 1961, p. 343.

⁷ M. L. Warren, *Investment for the Ordinary Man*, MacGibbon & Kee, p. 45.

⁸ H. Parkinson, *Scientific Investment*, Pitman, 1946, p. 85.

⁹ M. S. Rix, *op. cit.*, p. 143.

¹⁰ H. Parkinson, *op. cit.*, p. 85.

¹¹ M. S. Rix, *op. cit.*, p. 143.

¹² *Ibid.*, p. 144.

¹³ G. W. Dowrie, *et al.*, *op. cit.*, p. 343.

(e) Prior charges and equity capital at market value (*Financial Times*)¹⁴

2.2 The income method

(a) The 'times covered' method - Total profit/Interest paid (Rix)¹⁵

(b) The 'priority' percentages method, e.g. '5 per cent debentures 0-3, preference shares 4-20, ordinary dividend 21-40, reserves 41-100' where each figure is a percentage of last year's profit after tax but before debenture interest and preference dividends.

(c) Net profit/Interest paid (Parkinson)¹⁶

(d) (Change in Net profit/Net profit) ÷ (Corresponding change in Total profit/Total profit)¹⁷

2.3 Mixed capital and income methods

In addition to the methods which fall under either the capital or the income method, there are two measures which combine both methods. They are:

(a) $\frac{\text{Total Capital}}{\text{Equity Capital}} \times \frac{\text{Net Profit}}{\text{Total Profit}}$ NAA¹⁸

(b) $\frac{\text{Net Profit}}{\text{Equity Capital}} \div \frac{\text{Total Profit}}{\text{Total Capital}}$ (Pearson Hunt)¹⁹

Algebraically these two measures are identical. They do, however, represent different approaches.

3. Using the gearing measurements

As I said on page 18, the majority of writers on the subject use their preferred ratio only to label a firm as having a high or low gearing. To forecast or to analyse the effect of gearing, they revert to the absolute figures. In contrast, two authors do use their ratios. Their method is described below. (Please refer to Table 1 for the figures used as raw materials.)

3.1 Rix's use

Rix²⁰ would say that the firm's gearing at the end of year one was 1.25 (its total profit divided by its net profit), and that this meant that if its total profit rose 50 per cent then its net profit would rise 1.25 times 50 per cent (i.e. 62½ per cent). This relationship also applies to the rate of total profit on total capital, and of net profit on equity capital; if the ratio of total profit on total capital rises 50 per cent then the ratio of net profit on equity capital will rise 62½ per cent.

¹⁴ *Financial Times, An Investor's Guide*, Financial Times, 1960, p. 66.

¹⁵ M. S. Rix, *op. cit.*, p. 143.

¹⁶ H. Parkinson, *op. cit.*, p. 90.

¹⁷ A proposal for precise definitions of 'trading on the equity' and 'leverage', Pearson Hunt, *Journal of Finance*, September 1961, p. 383.

¹⁸ NAA, 'Return on capital as a guide to managerial decisions', *NAA Research Report* No. 35, p. 38.

¹⁹ Pearson Hunt, *op. cit.*, p. 380.

²⁰ M. S. Rix, *op. cit.*, *loc. cit.*

TABLE 1

Year	1	2
Balance sheet items		
Prior charges	500	500
Equity capital	500	500
Total capital	1,000	1,000
Revenue account items		
Total profit	100	150
Interest paid	20	20
Net profit	80	130
Ratios		
Total profit/Total capital (%)	10	15
Net profit/Equity capital (%)	16	26
Gearing ratios		
Rix: $\frac{\text{Total profit}}{\text{Net profit}}$	1.25	1.15
NAA: $\frac{\text{Total capital}}{\text{Equity capital}} \times \frac{\text{Net profit}}{\text{Total profit}}$	1.60	1.73
Suggested method		
(a) gearing: $\frac{\text{prior charges}}{\text{equity capital}}$	1.00	1.00
(b) rate of interest paid: $\frac{\text{interest paid}}{\text{prior charges}}$	4%	4%

3.2 The NAA's use

The NAA²¹ would say that the firm's net profit on equity capital at 16 per cent in year one was 1.60 times its total profit on total capital (at 10 per cent and that this difference was due to leverage. They appear to suggest that this analysis can be used when comparing a firm's net profit on equity capital ratios between two periods to establish to what extent differences are due to financial factors (measured by leverage) and operating factors (measured by the ratio of total profit on total capital). However, this is not altogether correct as reference to Table 1 will show. In year two the firm's total profit on total capital has risen to 15 per cent, and as a result its net profit on equity capital has risen to 26 per cent. Its leverage as measured by the NAA has risen from 1.60 to 1.73, yet only operational factors (i.e. those measured by the total profit/total capital ratio) have been involved.

3.3 Discussion and suggestions

The Rix method is basically prognostic - it tells one what will happen in the future to net profit if total profit changes. The NAA method is basically analytical - it can be used to explain why at any period return on equity capital differs from return on total capital. Both methods suffer from the disadvantage

²¹ NAA, *op. cit.*, p. 39.

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that their measure of gearing changes as the profit of the firm changes (see foot of Table 1). One has therefore to recalculate gearing every time there is a change in profit before one can use the method either analytically or prognostically.

I should therefore like to suggest a method of measuring gearing which

- (a) gives a figure that does not vary merely because profit has varied, and
- (b) can be used prognostically, and
- (c) can be used diagnostically

The method is to measure gearing by the ratio of prior charges/equity capital *and also* to measure the average rate of interest paid on prior charges (a useful piece of information in its own right) by the ratio of interest paid/prior charges.²³ It will be observed in Table 1 that neither of these ratios varies with profit, and therefore meets objective (a). Having *measured* gearing by these ratios, management, shareholders or stockbrokers can then *use* them to meet objectives (b) and (c) by placing these ratios in a formula which may be used to calculate what rate of return on equity capital will result from any given rates of total profit on total assets, and of interest paid on prior charges, and for any given capital gearing. It can be used to predict what quantitative effect a change in any of these factors will have on the rate of return on the capital provided by the ordinary shareholder. It can obviously be used by management, starting from a desired return on equity capital, to plan acceptable rates of interest, and necessary returns on total capital and levels of capital gearing. Financial analysts may find it useful in separating the factors which have caused a change in the rate of profit available to the ordinary shareholder.

The formula²³ mentioned above is as follows:

$$\frac{\text{Net profit}}{\text{Equity capital}} = \frac{\text{Total profit}}{\text{Total capital}} + \left[\left(\frac{\text{Total profit}}{\text{Total capital}} - \frac{\text{Interest paid}}{\text{Prior charges}} \right) \times \frac{\text{Prior charges}}{\text{Equity capital}} \right] \quad (1)$$

The reasons for choosing the ratio of prior charges to equity capital to measure gearing are outlined in Appendix II.

Some of the uses to which this formula can be put are illustrated in the following simplified examples.

²³ Prior charges and interest paid can be given either their traditional meaning or the expanded meaning suggested in section 1. The author, naturally, favours the latter.

Example of prognosis

Given

- (1) Firm A's ratio of prior charges to equity capital is 0.5, and
- (2) its rate of interest paid on its prior charges is 5 per cent,
- (3) it is thought that its total profit on total capital will be 10 per cent this year.

Query What will be its ratio of net profit/equity capital?

Answer

$$\begin{aligned} \frac{\text{Net profit}}{\text{Equity capital}} &= 10\% \times (10\% - 5\%) \times 0.5 \\ &= 10\% + (5\% \times 0.5) \\ &= 12\frac{1}{2}\% \end{aligned}$$

Example of diagnosis

Given The net profit on equity capital of firm A was 25 per cent and of firm B was 28 per cent.

The relevant ratios are:	A	B
1. Net profit/Equity capital	25	28
2. Total profit/Total capital	19	15
3. Interest paid/Prior charges	1	2
4. Prior charges/Equity capital	0.33	1.00

Query Was this due to differences in the efficient use of assets or differences in methods of financing?

Answer

An examination of these ratios shows - line 2 - that firm A uses its assets more profitably than firm B (firm A's ratio of total profit on total capital is greater than firm B's). Firm B offsets this disadvantage by - line 4 - its different financial structure (its prior

²³ Proof

Rewrite the formula symbolically as follows:

$$\frac{NP}{EC} = \frac{TP}{TC} + \left[\left(\frac{TP}{TC} - \frac{IP}{PC} \right) \times \frac{PC}{EC} \right]$$

Then

$$\begin{aligned} \text{RHS} &= \frac{TP}{TC} + \left(\frac{TP}{TC} - \frac{IP}{PC} \right) \times \frac{PC}{EC} \\ &= \frac{TP}{TC} + \frac{TP \times PC}{TC \times EC} - \frac{IP \times PC}{PC \times EC} \\ &= \frac{(TP \times EC) + (TP \times PC) - (TC \times IP)}{TC \times EC} \\ &= \frac{TP (EC + PC) - (TC \times IP)}{TC \times EC} \\ &= \frac{(TP \times TC) - (TC \times IP)}{TC \times EC} = \frac{NP}{EC} = \text{LHS} \end{aligned}$$

charges/equity capital ratio is 1.00 compared with firm A's 0.33), which explains the given fact that its ratio of net profit/equity capital is greater (at 28 per cent) than firm A's (at 25 per cent). If the firms were in the same industry, one would suggest that firm A should give priority to considering changes in its financial structure, whilst firm B should concentrate first on trying to improve its use of its assets.

Example of planning

Problem A firm can earn 10 per cent on its total assets. What proportion of its capital would it need to borrow at 5 per cent to earn 15 per cent on its equity capital?

Answer

$$15 = 10 + [(10 - 5) \times \text{Borrowed capital} / \text{Equity capital}]$$

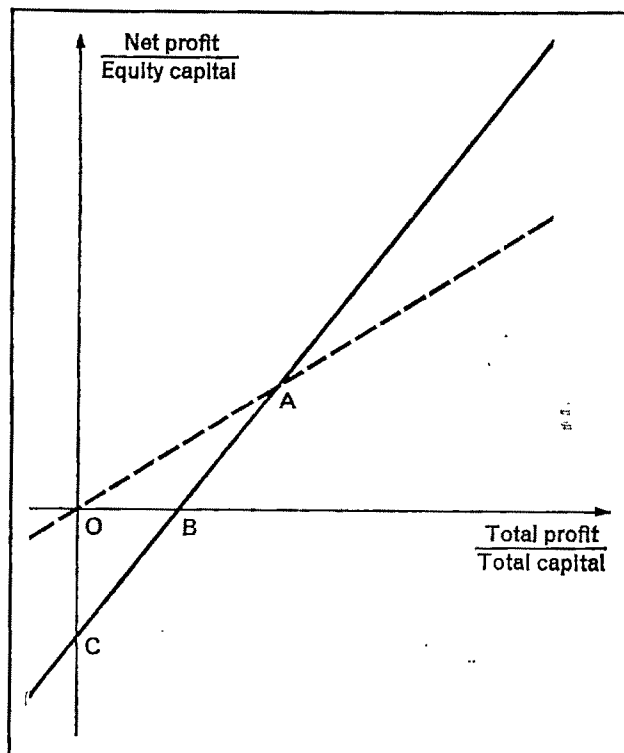
$$\therefore \frac{\text{Borrowed capital}}{\text{Equity capital}} = 1$$

i.e. it would have to borrow half its capital.

3.4 Graphical representation of the formula

Some people may find it easier to understand the workings of gearing by visualising it in terms of a graph. The mathematical details will be found in Appendix III; and only the essentials are dealt with here.

With the ratio of net profit/equity capital on the vertical axis and the ratio of total profit/total capital on the horizontal axis, one gets the following graph:



The unbroken line represents equation (1), the dotted line represents the equation

$$\frac{\text{Net profit}}{\text{Equity capital}} = \frac{\text{Total profit}}{\text{Total capital}}$$

The first point to notice is that

$$\frac{\text{Net profit}}{\text{Equity capital}} = \frac{\text{Total profit}}{\text{Total capital}}$$

at the point (A) where both are equal to the average rate of interest paid to prior charges (interest paid/prior charges). This then is the 'break equal' point. For rates of total profit/total capital greater than the rate of interest paid/prior charges, the rate of net profit/equity capital will be greater than the rate of total profit/total capital. Conversely, for rates of total profit/total capital less than the rate of interest paid/prior charges, the rate of net profit/equity capital will be less than the rate of total profit/total capital.

The point B could be described as the 'break even' point. At this point the rate of net profit/equity capital is zero; for rates of total profit/total capital greater than OB there will be some profit available for the

providers of equity capital, i.e.

$$\frac{\text{Net profit}}{\text{Equity capital}} \text{ will be positive.}$$

The point C could be called the 'cut into point'. It shows at what rate (OC) the equity capital of the business would be eroded to meet the prior charges requirements for interest at the point where the assets of the business were being used at zero profitability.

It is interesting to note that the 'break equal' point is independent of the proportion of capital raised from prior charges and from equity capital (capital gearing). If this proportion changes the effect is to pivot the full line around the point A. A corollary of this is that if the rate of interest changes while the capital gearing remains constant then the effect is to slide the full line (without changing its slope) up the dotted line until A coincides with the new rate of interest.

The final point of interest in the diagram is that the rate at which net profit/equity capital varies with changes in total profit/total capital is constant, i.e. the full line is a straight line and not a curve. The rate of change (i.e. the gradient of the line) is given by the

$$\text{formula } 1 + \frac{\text{Prior charges}}{\text{Equity capital}}$$

change is directly proportional to the measure of gearing which I have suggested should be used.

TABLE 2

Firm A
Corporation tax

	£	s
Profit	1,000	
Preference dividend (gross)*	500	
Net profit before tax	500	
Corporation tax at (say) 40% on £1,000	400	
Net profit after tax	£100	

Difference=£300 less £100=£200=Corporation tax at 40% on gross preference dividend of £500

Income tax and profits tax

	£	s
Profit	1,000	
Preference dividend (gross)	500	
Net profit before tax	£500	
Income tax payable on £1,000 at 7s 9d less retained from preference dividend (Section 184)	387	10
Income tax suffered	193	15
Profits tax at 3s on £1,000†	150	0
Total tax suffered	343	15
Net profit after tax	£156	5

Difference=£231 5s less £156 5s=£75=Profits tax at 3s in £ on gross preference dividend of £500

* The preference dividend or debenture interest is paid to the shareholder after deducting tax at the standard rate of income tax. This deduction used to be retained by the company. Under corporation tax this deduction has to be paid over to the Inland Revenue.

† For simplicity no allowance has been made for the abatement that a small profit would attract.

Firm B

	£	s
Profit	1,000	
Debenture interest (gross)*	500	
Net profit before tax	500	
Corporation tax at (say) 40% on £500	200	
Net profit after tax	£300	

	£	s
Profit	1,000	
Debenture interest (gross)	500	
Net profit before tax	£500	
Income tax payable on £1,000 at 7s 9d less retained from debenture interest (Section 169)	387	10
Income tax suffered	193	15
Profits tax at 3s on £500†	75	0
Total tax suffered	268	15
Net profit after tax	£231	5

4. The modifying effects of taxation and holding companies

4.1 Taxation

So far, no mention has been made of taxation – whether, for example, when defining the various profit figures which are included in the definitions of gearing given above, they should be before or after tax or whether in Britain the preference dividends and interest payments should be gross or net of income tax deducted. The reasons for leaving this subject to the end are that not only does tax legislation vary from country to country but it varies over time (an important example of the latter being the change to corporation tax in Britain). The relevance that taxation has to gearing is that in Britain and, I believe, in the USA it makes finance raised by an issue of preference shares more expensive than an issue of debentures bearing a rate of interest equal to the preference dividend. Obviously one can either treat this as being an effect of taxation or as an effect of the method chosen to raise finance. My preference is to treat taxation as a separate subject for ratio analysis, i.e. to devote one stage of the analysis to the effects of tax.²⁴ If the British analyst does this, his profits at the

first stage should be before tax and interest payments gross.

On the other hand, one can consider the results of governmental intervention piecemeal, i.e. at the same time as one is considering the particular parts of the business on which the revenue have chosen to operate.

As mentioned above, the main effect of tax legislation on gearing is the distinction drawn between a preference dividend and debenture interest. Under the British system of corporation tax, debenture interest is an allowable deduction in arriving at taxable profits but a preference dividend is not. The result of this is to make preference shares a more expensive source of finance than debentures bearing a rate of interest equal to that of the preference dividend. This difference is illustrated in Table 2. Both firms A and B make a profit of £1,000; firm A pays a preference dividend whilst firm B pays the same amount but in debenture interest. Purely as a result of this difference firm A pays £200 more corporation tax (at 40 per cent) than firm B.

²⁴ See 'Analysing Return on Equity Capital' by C. A. Westwick, *The Manager*, January 1965.

A method of dealing with the effect of this difference on gearing would be to add to interest paid the increase in corporation tax payable as a result of paying a preference dividend rather than an equivalent amount in (say) debenture interest. In the example this would mean treating the cost of finance from preference shareholders as £700 (£500 + £200) under corporation tax.^{24a}

4.2 Holding companies

The total profit/total capital ratio of a holding company may vary disproportionately with the profits of its subsidiaries if their capital structures exert a gearing effect on the profits attributable to the holding company. This effect, sometimes referred to as hidden gearing because of the lack of information about subsidiaries' capital structure in the parent's balance sheet, will be complicated where different subsidiaries have different gearing ratios and different profitabilities.

The situation is analogous to a business with divisions instead of subsidiaries and where the operating leverage^{24b} of each division varies.

The extent to which either situation can be brought into the analysis will depend on how much information is available. This topic is dealt with in the next section.

5. Availability of information

5.1 Position of the analyst

The extent to which the suggestions put forward in this article can be adopted in practice will depend on the position of the analyst *vis à vis* the company. If he is a director, or a consultant he will have to bear in mind only the cost of obtaining the necessary information. If he provides finance or credit, the amount of information that he will be able to get obviously will depend on his bargaining power. If he is in any other position, however, the amount of information available will depend on (a) the law of the country concerned, and (b) the attitude of the company towards disclosure.

It is partly because of such differences that the subject has been left to last. Also, I feel that one should consider first what is desirable, then whether it is practical, then finally, if the barriers to practicability are man-made, whether they should be removed.

5.2 British Law

Under the Companies Act 1948 a limited company was compelled to disclose separately the main figures for shares and dividends, debentures and the interest on them, and any overdraft. Interest on fixed loans had to be disclosed, but not that on an overdraft. Trade and expense creditors, tax reserves and pro-

visions had to be shown. Discounted bills were shown as a contingent liability.

To the requirements of disclosure of the 1948 Act, the Companies Act 1967 has added: bank overdraft interest, all loan interest [2 Sch. 12(1)(b)]; sums payable for the hire of plant and machinery [2 Sch. 12(1)(gb)].

There is, however, still no compulsion to disclose separately:

- (a) loans repayable within five years,
- (b) rent of land and buildings (despite the recommendation of Jenkins²⁵ the Chairman of the London Stock Exchange²⁶, and its inclusion in the Companies Bill [2 Sch. 12(1)(gb)]).
- (c) the capital value of rented or hired assets (except that the value of freehold land to be shown separately from that of leasehold land and leasehold land to be sub-classified into that held on long and short leases [2 Sch. 11(6)(c)]).
- (d) hire purchase interest, factoring charges, or bill discount.

To some extent, too, the problem of hidden gearing, which arises because the law does not require disclosure of the existence of prior charges in the minority interest figure in a holding company's balance sheet, has been tackled by the Companies Act 1967. This requires companies to disclose (a) the names of subsidiaries and the percentage of the subsidiaries' share capital held by the company and (b) the names and particulars of associated companies' share capital and the percentage held by the parent company.²⁷

At one time the requirements of the Stock Exchange for disclosure of relevance to gearing were in advance of the Companies Act, but with the coming

^{24a} The difference between a preference dividend and debenture interest has been accentuated by corporation tax. Under the previous British tax system neither preference dividends, nor interest on long term loans, were an allowable deduction in arriving at profits for income tax purposes. However, provided these payments were made out of taxable profits, the payer was permitted to deduct tax at the standard rate from the payments and to retain it (Sections 169 and 184 of the Income Tax Act, 1952). The effect in these circumstances was, therefore, the same as if they had been allowable as deductions.

For profits tax purposes, interest payments were an allowable deduction but preference dividends were not (because the Revenue considered them to be a distribution of profits). However, profits tax could not be deducted from the preference shareholders' dividend. Under income tax and profits tax (at the rates prior to the change to corporation tax) firm A paid £75 more profits tax than firm B compared with the £200 more corporation tax (at the rate at which that tax was introduced) that it now has to pay.

^{24b} Koehler, in his *Dictionary for Accountants*, defines operating leverage as the tendency of net income to vary disproportionately with sales.

²⁵ *Report of the Company Law Committee, op. cit.*, p. 153.

²⁶ *Accountancy*, December 1964, p. 775.

²⁷ *Companies Act 1967*, S. 3 & 4.

of the 1967 act this is no longer so, except that its requirements on disclosure relating to subsidiaries and associates are wider than the Acts,²⁸ in that they require information on reserves and loan capital.

No doubt the time will return when the Stock Exchange will again be leading the legislature.

An interesting move in the field of disclosure is that the proposed Commission on Industry and Manpower may have powers to compel individual companies to disclose information about their subsidiaries.²⁹

The Institutes of Chartered Accountants in the United Kingdom and the Association of Certified and Corporate Accountants in 'Companies Legislation in the 1970s' make a number of recommendations of relevance to gearing, which may be incorporated in future legislation, namely:

- (a) loans to a company under the control of the lending company's directors should be separately disclosed in the accounts of both companies [paragraph 42];
- (b) requirements for disclosure of borrowings in the balance sheet and interest on borrowings in the profit and loss account should be consistent with each other [paragraph 77];
- (c) a number of recommendations enabling the Board of Trade to exempt companies from disclosing information about their subsidiaries [paragraphs 45 and 60];
- (d) Section 4 of the Companies Act 1967 should be amended to require disclosure of a parent company's aggregate holding in excess of 10 per cent, direct and indirect, in associated companies [paragraph 61].

5.3 A practical compromise

For the analyst who cannot get some of the information listed at the end of Part 1, a practical compromise would be to include in prior charges all those items for which both capital values and the relevant interest payments are available. Where only the capital value is available, it would have to be deducted from assets in arriving at total capital; and where only the interest payment is known, it would have to be

²⁸ The Stock Exchange, London, Appendix 34 as amended April 1969, p. 294.

²⁹ *Keesings Contemporary Archives*, 18-25 July 1970, p. 24,084. Although the Bill to set up this new Commission was published on March 13th, and given a second reading in the House of Commons on April 8th 1970... the Committee stage had not been completed before the dissolution of Parliament on May 29th 1970 and the Bill accordingly fell. During the second reading debate Mr Robert Carr, now Secretary of State for Employment and Productivity, stated that 'the next Conservative Government' would 'inevitably, unfortunately, have to make radical changes in the composition, the constitution, the terms of reference, the procedures and the powers of the C.I.M. as proposed in the Bill.'

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deducted from revenue in arriving at total profit. Obviously, where neither the capital value nor the interest payment was known (e.g. factored debts) no adjustment would be needed.

A special situation arises as a result of section 149(5) of the Companies Act 1943 which permits a holding company not to submit a profit and loss account if it submits a consolidated profit and loss account. This means that in many cases the analyst will have to work from a consolidated balance sheet and profit and loss account both containing items relating to 'minority interests'. Ideally they should be split between prior charges and equity capital according to the nature of the subsidiaries' capital involved. This may however be difficult as a result of a lack of readily available information. In which case the analyst may decide to add all minority interests either to equity capital or to prior charges. I prefer the latter treatment because it leaves the return on equity capital equal to the return on the holding companies equity which has the virtues of simplicity and ease of understanding.

Appendix I

An example of the treatment of the leasing of plant

In an article on plant leasing, R. Ogden, northern manager of the Astley Leasing Co Ltd gives as an example of a lease contract the following figures:

- (a) Cost £10,000
- (b) Primary rental: five years at £2,488 p.a.
- (c) Secondary rental: five years at £120 p.a.

Let us see how such a contract would be dealt with if the suggestions outlined in footnote 2 on page 20 above were adopted.

Let us assume the plant is expected to last 10 years and that the lease rental is paid yearly on 31 December

Preliminary calculations

5 years at £2,448	= £12,240
5 years at £120	= 600
<hr/>	
Total cost under lease	= 12,840
Cash price	= 10,000
<hr/>	
Therefore, interest	= £2,840

Average amount of principal outstanding = £1,000 ×

$(10 + 8 + 6 + 4 + 2) / 5 = £6,000$. Therefore, annual rate

of interest = $\frac{£2,840}{£6,000 \times 5} = 9.5\%$ approximately.

TABLE 3

31 December, Year:	1	2	3	4	5	6	7	8	9	10
A. Journal entries										
(1) Dr. leasing company	2,000	2,000	2,000	2,000	2,000	—	—	—	—	—
interest paid	948	758	588	378	188	—	—	—	—	—
	2,948	2,758	2,568	2,378	2,188	—	—	—	—	—
Cr. cash	2,448	2,448	2,448	2,448	2,448	120	120	120	120	120
Interest suspense										
account (or dr. if										
in brackets)	500	310	120	(70)	(260)	(120)	(120)	(120)	(120)	(120)
	2,948	2,758	2,568	2,378	2,188	—	—	—	—	—
Payment of rent										
(2) Dr. depreciation	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Cr. plant	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Year's depreciation										
B. Extracts from balance sheet										
<i>Liabilities</i>										
Leasing company	8,000	6,000	4,000	2,000	—	—	—	—	—	—
Interest suspense account	500	810	930	860	600	480	360	240	120	—
<i>Assets</i>										
Plant	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
less depreciation	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
Net	9,000	8,000	7,000	6,000	5,000	4,000	3,000	2,000	1,000	—
C. Extracts from profit and loss account										
Depreciation	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Interest paid	948	758	588	378	188	—	—	—	—	—

The first journal entry would be
 1 January, Year 1 Dr Plant £10,000
 Cr. Leasing company £10,000
 Acquisition on lease of plant

Subsequent journal entries and extracts from the firm's balance sheet and profit and loss accounts are given in Table 3 and are, I think self explanatory. The interest suspense accounts is created mainly so that the secondary rentals may be taken out of it when they are paid. If this were not done one would appear to be still paying interest on a loan which had been repaid.

Appendix II

The reasons for choosing the ratio of prior charges to equity capital

The ratio of prior charges to equity capital was chosen to measure gearing for the following reasons:

- (a) As it was desired to establish a formula which provides a link between the ratio of net profit on equity capital and the ratio of total profit on total

capital, and as all the income methods of measuring gearing (see section 2.2 above) involve the use of either net profit or total profit, any formula using an income method of measuring gearing is tautological. All the income methods were therefore ruled out.

- (b) The combined income and capital methods (see section 2.3 above) were ruled out for the same reason.

- (c) There are six possible ways of measuring gearing by a capital method – the four ways listed in section 2.1 above, plus total capital/prior charges and equity capital/total capital. Three are, however, only reciprocals of the other three. Of the remaining three, the ratio of prior charges to equity capital was chosen because it gives the simplest formula for the relationship between the ratio of net profit on equity capital and total profit on total capital.

If gearing is measured by the ratio of prior charges to total capital then the relationship is as follows:

$$\frac{\text{Net profit}}{\text{Equity capital}} = \left[\frac{\text{Total profit}}{\text{Total capital}} - \left(\frac{\text{Prior charges}}{\text{Total capital}} \times \frac{\text{Interest paid}}{\text{Prior charges}} \right) \right] \div \left[1 - \frac{\text{Prior charges}}{\text{Total capital}} \right] \dots \dots \dots (2)$$

If gearing is measured by the ratio of total capital to equity capital then the relationship would be:

$$\frac{\text{Net profit}}{\text{Equity capital}} = \left[\frac{\text{Total profit}}{\text{Total capital}} \times \frac{\text{Total capital}}{\text{Equity capital}} \right] - \left[\frac{\text{Interest paid}}{\text{Prior charges}} \times \left(\frac{\text{Total capital}}{\text{Equity capital}} - 1 \right) \right] \dots \dots (3)$$

I think it will be agreed that formula (1) is more simple than either formula (2) or formula (3).

Appendix III

Graphical representation of the formula

Please refer to diagram 1.

The y axis shows net profit/ equity capital, and the x axis total profit/total capital.

It will be seen from the formula that

$$\text{when } \frac{\text{Interest paid}}{\text{Prior charges}} = \frac{\text{Total profit}}{\text{Total capital}}$$

$$\text{then } \frac{\text{Net profit}}{\text{Equity capital}} = \frac{\text{Total profit}}{\text{Total capital}}$$

Construct therefore a line representing the equation:

$$\frac{\text{Net profit}}{\text{Equity capital}} = \frac{\text{Total profit}}{\text{Total capital}}$$

This will, of course, pass through the origin. On this line, mark the point where net profit/equity capital = total profit/total capital = interest paid/prior charges. Let us call this point C. The gradient of the line is given by the formula $(1 + \text{prior charges/equity capital})$.⁸⁰

⁸⁰ For symbolic simplicity rewrite the formula

$$\frac{NP}{EC} = \frac{TP}{TC} + \left(\frac{TP}{TC} - \frac{IP}{PC} \right) \times \frac{PC}{EC}$$

as

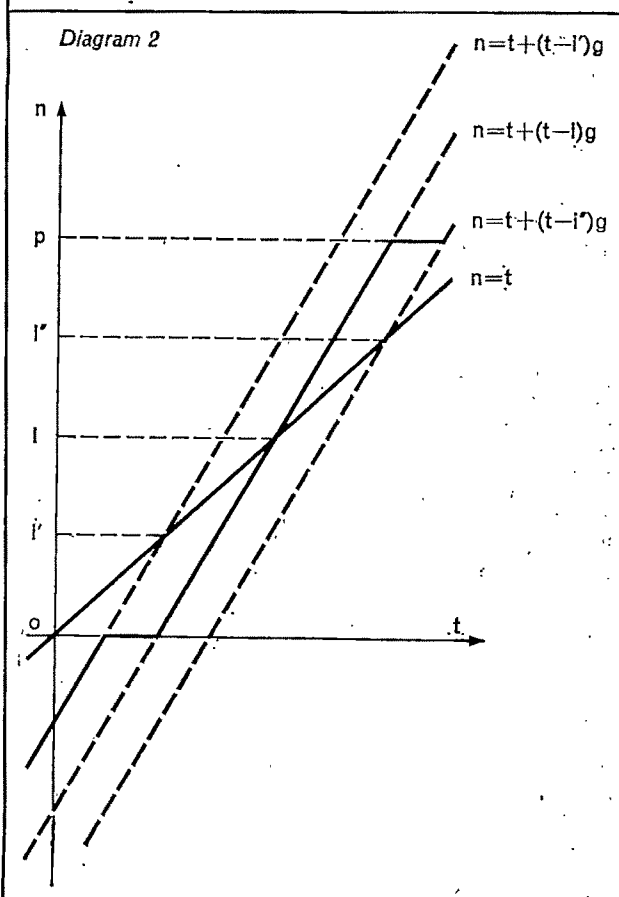
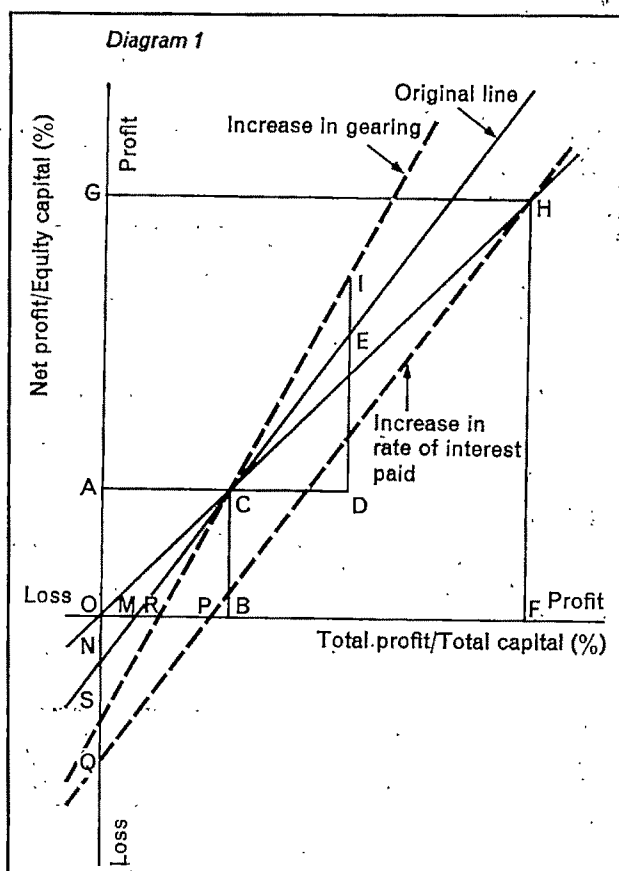
$$n = t + (t-i)g$$

then

$$n + dn = t + dt + (t + dt - i)g$$

and

$$\begin{aligned} \frac{dn}{dt} &= \left[t + (t-i)g - n \right] + \frac{dt}{dt} + \frac{dt}{dt} \times g \\ &= 0 + 1 + g \end{aligned}$$



Draw a horizontal line, one unit long, from C to a point which we shall call D. Then from D draw a vertical line $(1 + \text{prior charges/equity capital})$ units long to a point which we shall call E. Finally, draw a third line through C and E. This is the line of the equation.

The point (M) at which this line cuts the total profit/total capital axis shows the rate of total profit on total capital (OM) below which a firm will be unable to meet its interest without drawing on reserves. The point (N) at which the line cuts the net profit/equity capital axis indicates the rate (ON) at which a firm would have to cut into its reserves to meet interest if its total profit/total capital was equal to nil.

If a firm's interest paid/prior charges ratio increases for any reason, then the effect is to move the line over to the right, and parallel to the original line, to a point where it intersects the net profit/equity capital = total profit/total capital line at the new rate of interest paid (GH or FH).

If a firm's gearing increases, the effect is to pivot the line about the point C until its gradient is given by the new $1 + \text{prior charges/equity capital}$ (DI/DC).

The new break-even and 'cut-into' rates resulting from the change in the rate of interest paid are given by OP and OQ. The corresponding rates for the change in gearing are OR and OS.

The formula and the graph are based on the assumption that the rate of interest paid does not vary with the rate or amount of total profit or net profit.

This assumption would not be correct where prior charges included participating preference shares or preference shares whose dividends are non-cumulative and not payable if the firm makes a loss. These possibilities may be represented graphically as in diagram 2.

There i = the rate of interest paid on prior charges *including the normal* preference dividend

i' = the rate of interest paid on prior charges *excluding* the preference dividend

i'' = the rate of interest paid on prior charges *including the participating* preference dividend

n = the rate of net profit on equity capital

p = the rate of net profit on equity capital above which preference shares become participating

Let t = the rate of total profit on total capital

g = the ratio of prior charges to equity capital.

This ratio will not be affected by changes in i .

Construct lines of the three equations

$$n = t + (t - i)g \quad (4)$$

$$n = t + (t - i')g \quad (5)$$

$$n = t + (t - i'')g \quad (6)$$

The composite line which we want will be made up of the line of

equation (5) where $n \leq 0$

equation (6) where $n > p$

equation (4) where $0 < n < p$

A Risk Analysis Approach to Marginal Cost Pricing

John Sizer

All decisions which deal with the future involve risk and uncertainty, and the attitude of the decision-maker is conditioned by the degree of risk and uncertainty involved. Accountants, by tradition and training, are conservative and cautious in their attitude to the future. They anticipate losses before they are incurred but never gains before they are realised. The full cost or cost-plus approach to pricing decisions is attractive to the accountant under conditions of uncertainty, it provides a *starting point* from which the process of fixing selling prices can begin. With the full cost approach the volume of output is fixed or set at an assumed *normal* level, usually for one year, and the product costs are based on that volume. The accountant knows that the product cost covers the full cost of production, selling, distribution and administration. Marginal cost, on the other hand, provides him not with a starting point but a rock bottom price, and not one which will cover the 'full' cost at normal capacity.

Organisational theorists¹ have argued that firms develop a number of simple operating rules and the organisation's rules permit the transfer of past learning. Full cost pricing procedures provide such simple operating rules:

'The main attraction of cost plus is, of course, that it offers a means by which plausible prices can be found with ease and speed, no matter how many products the firm handles. Moreover, its imposing computations look factual and precise, and its prices may well seem more defensible on moral grounds than prices established by other means.'²

Full cost pricing appears to offer a procedure which enables the complex problem of pricing involving considerable uncertainty to be reduced to a rather simple problem with a minimum of uncertainty. For

example, a recent study³ of the export marketing policies of a sample of fifty companies in the agricultural machinery, mechanical handling and textile machinery industries found that frequently price is a function of costs alone. The most common price procedure found in the firms covered in the sample was the cost-plus or full cost method or some variant of it. Only one firm visited explicitly practised a variant of marginal costing. Firms considered that cost-plus pricing permitted a policy of relative price and profit stability to be pursued over the short term and as between different customers. Hovell suggests that this price stability reflects many chief executives' reluctance to delegate pricing decisions and yet not become overburdened by such decisions themselves. 'In most cases they are content to establish simple scales of non-discretionary sales discounts and minor profit margin differentials between major product groups. Within such a framework the mechanical computation of final prices is left to cost clerks.' Wilfred Brown and Elliot Jacques developed their Product Analysis Pricing⁴ procedures to enable a chief executive to delegate pricing decisions to subordinates in those companies which manufacture to the specific requirements of customers, while at the same time maintaining control of the price structure by setting explicit policy within which pricing is carried out. It is more difficult to develop simple operating rules which appear to minimise uncertainty when marginal cost pricing is employed, particularly when a company manufactures to the specific requirements of customers. Marginal cost pricing recognises that decision-making is essentially a process of choosing between competing alternatives, each with its own combination of income and costs; and that the relevant concepts to employ are incremental costs and revenues

¹ R. M. Cyert and J. G. March, *A Behavioural Theory of the Firm*, Prentice Hall, Englewood Cliffs, 1963, p. 104.

² W. T. Baxter and A. R. Oxenfeldt, 'Costing and Pricing: The Cost Accountant versus The Economist', in *Studies in Cost Analysis*, ed. David Solomons, Sweet and Maxwell, London 1968, p. 296.

³ P. J. Hovell, 'Export Pricing Policies', *District Bank Review*, September 1968, pp. 34-55.

⁴ Wilfred Brown and Elliot Jacques, *Product Analysis Pricing*, Heinemann, London 1964.

and opportunity cost, not full costs which include past or sunk costs.

It appears that in many firms marginal cost pricing principles are not employed, or are restricted to what might be called 'secondary' pricing decisions. In these situations forecasting the demand curve is not very important, and the firm is frequently a *price taker*. These 'secondary' pricing decisions are not seen as long run decisions. Thus, Herson and Hertz,⁵ in a highly critical reappraisal of marginal cost pricing recommend the use of marginal cost data for pricing purposes only when providing 'assistance in determining the advisability of special pricing . . . during the operating period'.

In fact, the accountant may persuasively argue that:

- (a) his system of providing full cost estimates for pricing purposes is quick and cheap to operate;
- (b) it enables top management to delegate the complex decision of pricing by devising a number of simple costing rules which they can keep within their control; and
- (c) marginal cost pricing relies heavily on demand forecasts which marketing executives are unable to estimate accurately.

For these reasons and other reasons many progressive, as well as less enlightened accountants, have been prepared to rely on the total costs of conventional absorption costing for pricing purposes when the firm is a *price maker*. However, regardless of how the percentage mark-up is established, critics of full cost pricing procedures argue that:

- (a) it tends to ignore the demand function and assume that prices are simply a function of costs;
- (b) it fails to reflect competition accurately;
- (c) it is based on a concept of cost (full cost) that is frequently not relevant to the pricing decision at hand;
- (d) it overplays the precision of allocated fixed costs, and possibly common capital employed, in a multi-product business;
- (e) despite Hertz and Herson's assertions,⁶ the allocation of common fixed costs to product groups does not measure the opportunity cost of directing managerial effort at particular products because opportunity costs should be measured in terms of profits foregone not costs incurred; and
- (f) it is based on a long run pricing concept, and it is doubtful whether it is useful to think in terms of the long run in modern business.

Baxter and Oxenfeldt⁷ have neatly summarised the

major criticism of full cost pricing:

'On the other hand, inability to estimate demand accurately and in time scarcely excuses the substitution of cost information for demand information. Crude estimates of demand may serve instead of careful estimates of demand but cost gives remarkably little insight into demand.'

They also argue that the objections to cost-plus sound formidable in the classroom, but cut remarkably little ice outside, and that the cost accountant often concedes in private discussions that these objections have some validity. The point is that one can never create in the classroom the conditions of risk and uncertainty that exist in the real world. Computer based business games can be employed to simulate market conditions, but the rewards for success and the penalties for failure cannot be simulated.

It has been argued elsewhere⁸ that marginal cost pricing is theoretically superior to full cost pricing under conditions of certainty, but it has been suggested that the risk and uncertainty attached to the marginal cost approach makes it less attractive to the accountant in the real world. In this paper a simple approach is suggested which will enable the accountant to assist management in assessing the risk entailed in various pricing alternatives when the firm is a price maker and marketing a limited number of products.

Marginal cost pricing under conditions of certainty

With marginal cost pricing the firm seeks to fix its prices so as to maximise total contribution to fixed costs and profit. Unless the manufacturer's products are in direct competition with each other, this objective is achieved by the price maker considering each product in isolation and fixing its price at a level which is calculated to maximise total contribution. For example, the Bang Bang Manufacturing Company is reviewing the selling price of Product X, a consumer durable, and after carrying out extensive market research has estimated the following annual demands for the product at varying prices.

Price	Estimated annual demand
£17	8,000
£17.5	7,800
£18 (existing price)	7,600
£18.5	7,200
£19	6,600
£19.5	5,700
£20	4,200

It is anticipated that each of these demands can be

⁵ R. J. L. Herson and R. S. Hertz 'Direct Costing in Pricing: A Critical Reappraisal', *Management Services*, March-April 1968, p. 43.

⁶ *Op. cit.*, p. 43.

⁷ *Op. cit.*, p. 299.

⁸ John Sizer, 'The Accountant's Contribution to the Pricing Decision', *The Journal of Management Studies*, May 1966, pp. 129-50 and *An Insight into Management Accounting*, Penguin, London 1969, pp. 275-307.

TABLE 1

Bang Bang Manufacturing Company
Review of selling price of Product X

	£	£	£	£	£	£	£
Selling price	17.0	17.5	18.0	18.5	19.0	19.5	20.0
Marginal cost	12.0	12.0	12.0	12.0	12.0	12.0	12.0
<i>Contribution</i>	5.0	5.5	6.0	6.5	7.0	7.5	8.0
Estimated demand (units)	8,000	7,800	7,600	7,200	6,600	5,700	4,200
	£	£	£	£	£	£	£
Total contribution	40,000	42,900	45,600	46,800	46,200	42,750	33,600
Separable fixed costs	25,000	25,000	25,000	25,000	25,000	25,000	25,000
<i>Direct product profit</i>	15,000	17,900	20,600	21,800	21,200	17,750	8,600
Product break-even							
Sales (units)	5,000	4,545	4,167	3,846	3,572	3,333	3,125
Percentage of demand	62.5	58.3	54.8	53.4	54.1	58.5	74.4

manufactured and marketed with existing capacity. The average variable cost per unit over the relevant output range is constant at £12 per unit, i.e. marginal cost equals average variable cost. The *separable* fixed costs are £25,000, i.e. the fixed costs associated with the product, such as a product manager's salary, as opposed to the *common* fixed costs, such as the managing director's salary.

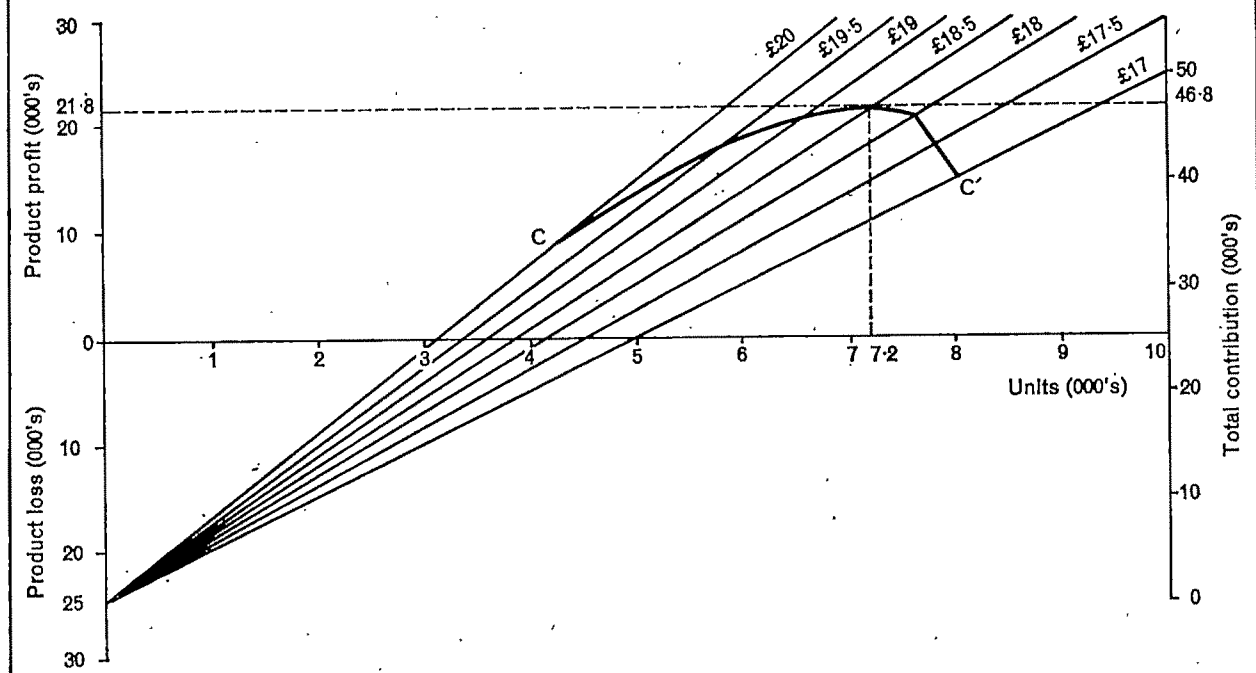
With the marginal costing approach the company determines which price will make the greatest contribution towards fixed costs and profit. The type of calculation the accountant could make is shown in

Table 1. It will be noted that the greatest profit improvement would result from raising the selling price of Product X from £18.0 to £18.5. With a cost-plus pricing procedure this price would only be arrived at by accident.

The information in Table 1 is presented in the form of a Profit-Volume Chart in Fig. 1. CC' is the *Contribution Curve* for Product X. It shows the relationship between demand in units, direct product profit, total contribution, and break-even units for each price. For example, a selling price of £18.5 would result in a demand for Product X of 7,200 units,

FIGURE 1

Profit-Volume chart



a total contribution of £46,800, a direct product profit of £21,000, and a product break-even at 3,846 units. In establishing the contribution curve and determining the price which promises the highest contribution, the demand function has been taken into consideration and the cost function is based upon a concept of cost (marginal cost) that is relevant to the pricing decision at hand.

It has been assumed that the Bang Bang Manufacturing Company is working below capacity and there is no limitation on the number of units that can be produced. If the company is in a limited capacity situation its products are competing for the limited production resources available, and the opportunity cost of using these resources must be considered. In this situation the demand and unit contribution which each alternative price would generate, together with the resources required to produce the product and the constraints on production, could be incorporated into a *linear programming* model.⁹ The objective is to determine the combination of products which maximises the total contribution towards fixed costs and profit. A set of simultaneous equations is constructed which represents the model of the problem and take into consideration all the variable factors and constraints. The equations are then solved, usually with the aid of a computer, to determine the optimal mix of products. The linear programming model could be used, for example, to determine whether it would be worthwhile producing and marketing an additional 600 units of Product X for an incremental contribution of £600 if the selling price was £18.5 rather than £19. The incremental contribution is only £1 per unit compared with a contribution per unit of £7 at a selling price of £19. The model would be solved for each alternative price and demand to give the optimal product mix and total contribution for each price of Product X. If the total contribution from the optimal product mix at a selling price of £18.5 is greater than that for £19, £18.5 is the price which maximises the firm's total contribution from all products. If the total contribution is less for £18.5 than £19, this indicates that it is preferable to allocate the resources required to produce an extra 600 units of Product X at a selling price of £18.5 to the production of alternative products which offer a greater incremental contribution.¹⁰

It will be appreciated that the reliability of the marginal cost calculation and the determination of the

optimal product mix using linear programming are dependent upon the accuracy of the demand forecast. The difference in total contribution between selling prices of £18, £18.5 and £19 is not great. A static deterministic model has been employed. The variables in the model are assumed to be known, but the forecast demand curve is only a 'most likely' estimate and the limits of accuracy which can be attached to it could well change the order of preference in choosing a selling price. Some accountants argue they have had bitter experiences in the past with over-optimistic 'most likely' estimates generated by marketing executives. Marketing has long been viewed as requiring mainly judgement, intuition, and experience, but marketing researchers are increasingly combining scientific techniques with judgement and intuition.¹¹ While these market researchers cannot accurately predict the shape of the demand curve, they should be able to attach limits of accuracy to their forecasts. The limits can be expressed in terms of *subjective probabilities*. With the assistance of *probability diagrams* to determine the alternative outcomes, graphs or tabulations can be presented which array the probable price-contribution outcomes according to a rational combination of possibilities involved. Risk profiles can be developed for each alternative price indicating the likelihood of achieving various total contributions. A *probabilistic* as opposed to a *deterministic* model can be developed.

Risk analysis approach

It is not possible to accurately determine the contribution curve CC', the break-even points, product profits, and total contributions for the various selling prices in Fig. 1. However, it should be possible to present to management a profit-volume chart which takes account of the uncertainty surrounding the pricing decision. Fig. 2 recognises that:

- (a) the contribution curve CC' can only be drawn as a band and for each price there will be a range of units demanded, product profit, and total contribution outcomes;
- (b) for each price there is a break-even area, and the precise location of the break-even point is not known and can only be broadly indicated; and
- (c) because of the many assumptions underlying the profit-volume chart, the analysis is only relevant over a limited range of output.

As well as receiving an indication of the range likely product profit and total contribution outcomes for each price, management also wish to know the likelihood of achieving each of these outcomes.

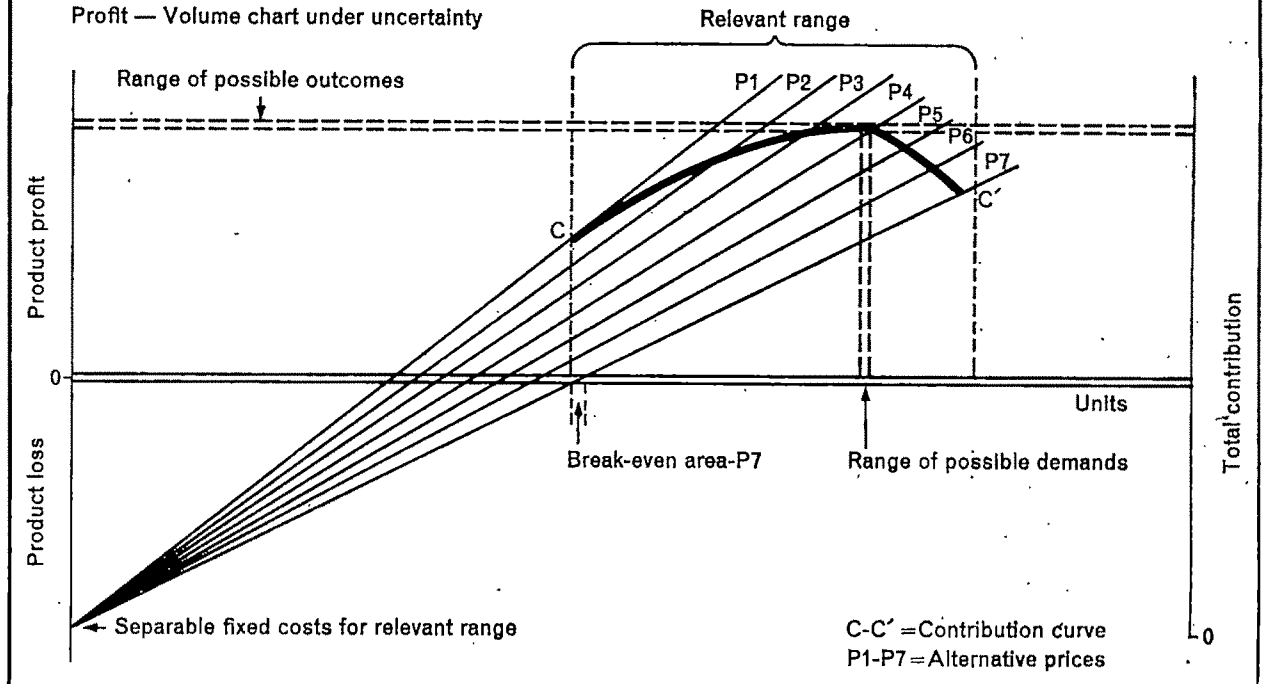
⁹ See B. V. Carsberg, *Introduction to Mathematical Programming for Accountants*, Allen & Unwin, London 1969.

¹⁰ For a detailed illustration of the application of linear programming to determine optimal product mix and to the evaluation of a proposed price change see A. J. Latham, 'Costs and Prices in the Petroleum Chemicals Industry' in *Studies in Accounting for Management Decision*, ed. A. M. Bourn, McGraw-Hill, London 1969.

¹¹ See Paul E. Green & Ronald E. Frank, *A Manager's Guide to Marketing Research: A Survey of Recent Developments*, Wiley, New York 1967.

FIGURE 2

Profit — Volume chart under uncertainty



management is interested in the shape and width of the contributions curve CC'. The proposed risk analysis procedure, which provides this information, is best illustrated by means of a simple example.

In reviewing the price of Product X, £18.5 appears to be the selling price which would result in the highest contribution to fixed costs and profit. The accountant realises that the reliability of the calculation is dependent upon the estimated demand schedule. When he discusses his calculation with the market researchers, he points out that the forecast of the demand curve is the critical variable in the calculation, and the forecast total contributions for selling prices of £18, £18.5 and £19 are nearly the same. The market researchers explain that the demand for each price is a most likely estimate and is obviously not 100 per cent reliable, and that the range of possible demand is not the same for each price. They are prepared to produce pessimistic and optimistic forecasts for each price and attach subjective probabilities to these. They provide the accountant with the following schedule:

It will be appreciated that the decision maker is *not* saying, for example, that at a price of £18 there is a 20 per cent probability of selling *exactly* 6,840 units, a 50 per cent probability of selling *exactly* 7,600 units, and a 30 per cent probability of selling *exactly* 8,360 units. In the original calculation 7,600 units as the most likely estimate was taken to be representative of the whole range of possible values. The decision maker is now providing a *discreet* probability distribution.¹² He is giving three estimates of the range of possible values, one representative of the middle range, one of the upper range, and the other of the lower range. For each estimate he is then indicating the probability of actual sales falling within the range of which 7,600 units is representative of the range. The subjective probabilities attached to the estimates represent a quantification of the decision makers' view

¹² An alternative approach is to use a continuous probability distribution function. For example, see R. K. Jaedicke and A. A. Robichek, 'Cost-Volume-Profit Analysis Under Conditions of Uncertainty', *The Accounting Review*, October 1964, pp. 917-26.

	£18		£18.5		£19.0	
	Probability	Units	Probability	Units	Probability	Units
Pessimistic	0.20	6,840	0.10	6,480	0.30	5,940
Most likely	0.50	7,600	0.60	7,200	0.50	6,600
Optimistic	0.30	8,360	0.30	7,920	0.20	7,260
	1.00		1.00		1.00	

TABLE 2

Contribution data for developing risk profiles

Outcome number	Demand	Contribution per unit £	Conditional total contribution £	Combined probability	Expected value £
Selling price: £18					
1	6,840	5.25	35,910	0.04	1,436
2	6,840	6.00	41,040	0.14	5,746
3	6,840	6.50	44,460	0.02	889
4	7,600	5.25	39,900	0.10	3,990
5	7,600	6.00	45,600	0.35	15,960
6	7,600	6.50	49,400	0.05	2,470
7	8,360	5.25	43,890	0.06	2,633
8	8,360	6.00	50,160	0.21	10,534
9	8,360	6.50	54,340	0.03	1,630
				1.00	E.V.=£45,288
Selling price: £18.5					
10	6,480	5.75	37,260	0.02	745
11	6,480	6.50	42,120	0.07	2,948
12	6,480	7.00	45,360	0.01	454
13	7,200	5.75	41,400	0.12	4,968
14	7,200	6.50	46,800	0.42	19,656
15	7,200	7.00	50,400	0.06	3,024
16	7,920	5.75	45,540	0.06	2,732
17	7,920	6.50	51,480	0.21	10,811
18	7,920	7.00	55,440	0.03	1,663
				1.00	E.V.=£47,001
Selling price: £19.0					
19	5,940	6.25	37,125	0.06	2,227
20	5,940	7.00	41,580	0.21	8,732
21	5,940	7.50	44,550	0.03	1,336
22	6,600	6.25	41,250	0.10	4,125
23	6,600	7.00	46,200	0.35	16,170
24	6,600	7.50	49,500	0.05	2,475
25	7,260	6.25	45,375	0.04	1,815
26	7,260	7.00	50,820	0.14	7,115
27	7,260	7.25	54,450	0.02	1,089
				1.00	E.V.=£44,995

of the future, based upon his previous experiences and any other information he may be able to assemble that is relevant to the estimates of the demand curve.

The accountant also realises that his estimate of marginal cost is also a most likely estimate, and produces an estimate similar to that produced by the market researchers:

	Probability £	Marginal cost £
Pessimistic	0.20	12.75
Most likely	0.70	12.00
Optimistic	0.10	11.50
	1.00	

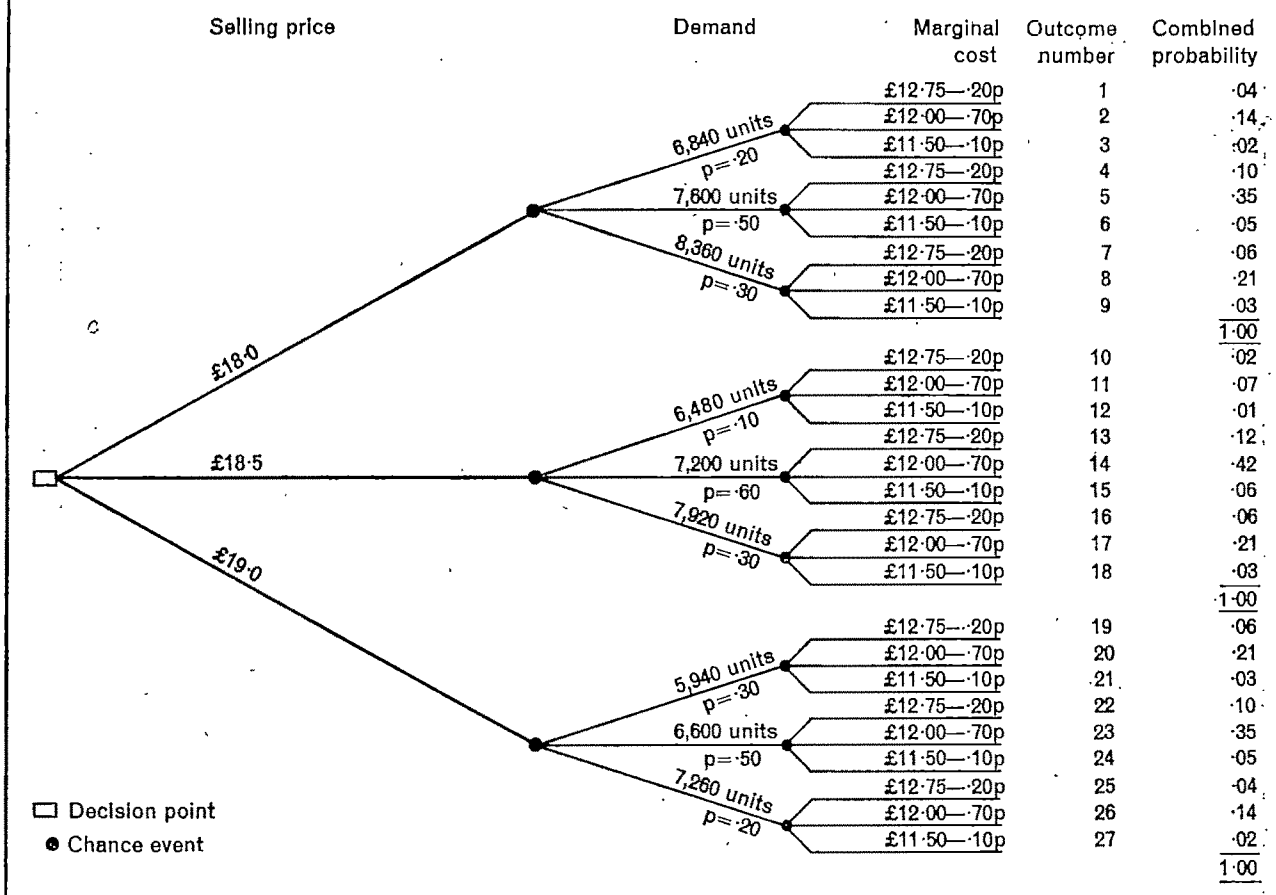
For each alternative price the accountant has three representative demands and marginal cost estimates

with probabilities attached, which combine to provide nine (3^2) possible total contributions for each price. Thus, for this illustration there will be 27 (3^3) possible total contribution outcomes for the three prices. These 27 possible outcomes are presented in the form of a *probability diagram* in Fig. 3. The probability of each possible outcome arising is calculated by multiplying the probabilities along each branch of the diagram.¹³ For example, the probability of selling 6,840 units at a selling price of £18 per unit and a marginal cost of £12.75 per unit, to give a contribution per unit of £5.25 and a total contribution of £35,910, is $0.20 \times 0.20 = 0.04$. For each alternative price the sum of the probabilities for the nine possible outcomes is equal

¹³ In multiplying probabilities it is assumed that the demand and marginal cost probabilities are independent, i.e. that marginal cost is constant over the relevant output range.

FIGURE 3

Probability diagram for review of selling price of product



to 1.00 because the sum of the demand probabilities and the marginal cost probabilities are also 1.00.

There are 27 possible outcomes for this simple illustration. It will be recognised that this illustration could easily be expanded. For example, separate probability forecasts could be estimated for:

- Market Size
- Market Share
- Direct Materials
- Direct Labour
- Separable Fixed Costs

With three probabilities for each of these factors and three alternative prices, there would be 729 (3^6) possible outcomes. While a large number of possible outcomes would be difficult to handle manually and present on a single probability diagram, it is a straightforward operation for a computer. The probability forecasts may also be based on competitors' possible reactions to price changes.

Returning to the illustration, for each selling price the probability and total contribution from each possible outcome, and the *expected value* of contribution for each price can be calculated. The *expected value* is not necessarily the most likely result, but an

average of the probable outcomes weighted by the probability that each will arise. Expected value introduces the concept of repeatability or a sequence of decisions. For any one single decision the outcome will be one of the set of possible outcomes, but if a large number of pricing decisions are each judged on the basis of expected values, the total contribution from all the pricing decisions combined will approximate to the sum of the individual expected value total contributions. The calculation of the expected values for the three selling prices is shown in Table 2. The conditional contribution outcomes and the probabilities of achieving each conditional outcome are also shown in this table. For example, with a selling price of £18.5 the conditional total contributions range from £37,260 to £55,440, but the expected value is £47,001. The most likely contribution is £46,800 and, on the basis of the probability estimates, there is a 42 per cent probability of attainment.

The accountant is now in a position to present to management in Table 3 a more complete picture of the pricing alternatives available. It will be noted that while the *most likely* total contribution at a selling price of £18.5 is only £600 greater than that at £19.0,

TABLE 3

Bang Bang Manufacturing Company
Review of selling price of Product X

Selling price	Most likely outcome		Expected value		Range of total contribution	
	Units	Total contribution	Units	Total contribution	Minimum	Maximum
£		£		£	£	£
18	7,600	45,600	7,676	45,288	35,910	54,340
18.5	7,200	46,800	7,344	47,001	37,260	55,440
19	6,600	46,200	6,534	44,995	35,640	54,450

TABLE 4

Price: £18		Price: £18.5		Price: £19.0	
Probability	Total contribution not less than:	Probability	Total contribution not less than:	Probability	Total contribution not less than:
%	£	%	£	%	£
100	35,910	100	37,260	100	37,125
98	39,900	98	41,400	94	41,250
86	41,040	86	42,120	84	41,580
72	43,890	79	45,360	63	44,550
66	44,460	78	45,540	60	45,375
64	45,600	72	46,800	56	46,200
29	49,400	30	50,400	21	49,500
24	50,160	24	51,480	16	50,820
3	54,160	3	55,440	2	54,450

after taking into account the subjective probabilities, the *expected value* is over £2,000 higher and the minimum and maximum outcomes are more attractive. The range of possible outcomes may also be presented in the form of a cumulative probability distribution as in Table 4. This table shows the probability of achieving not less than a certain total contributions for a given price. The management is now in a position to choose between the alternative prices with a clearer picture of the possible alternative outcomes.

If the company is in a limited capacity situation and a number of products are competing for the limited production resources available, the range of possible outcomes cannot be incorporated into a basic linear programming model to determine the optimal product mix. A basic model is deterministic, i.e. it assumes certainty. However, models have been developed using the technique of linear programming under uncertainty for both discreet and continuous probability distributions. For example, Hodges and Moore¹⁴ have developed a model, together with an appropriate computation procedure, to maximise the expected level of profit where the asymmetry of costs

of over-and under production make uncertainties in demand a significant factor.

Conclusion

A simple probabilistic model has been used to determine for each alternative price a risk profile which indicates the likelihood of achieving various total contribution. It has been assumed that:

- (a) the firm's objective in setting a price is to maximise the short-run contributions from the product;
- (b) the firm is a price maker offering a standard product to a mass market;
- (c) the price can be set independently of the levels set for the other marketing variables.

In a jobbing or contracting undertaking, where there is unlikely to be any significant degree of repetition of orders for similar products, the firm is also a *price maker* but is bidding for specific jobs rather than offering a product to a market at a price which will generate a certain demand. Model builders have also been active in the area of competitive bidding strategy.¹⁵

The third assumption implies that optimal values

¹⁴ S. D. Hodges and P. G. Moore, London Graduate School of Business Studies, 'Production Planning under Stochastic Demand' (to be published).

¹⁵ For example see Franz Edelman, 'Art and Science of Competitive Bidding', *Harvard Business Review*, July-August 1965, pp. 53-66.

can be determined for advertising, personal selling, product quality, and other marketing variables before price is set. A similar approach could be applied to a situation where price is being held constant and one of the other variables in the marketing mix changed. For example, when varying the contents in a fixed price packet. In practice, the several marketing variables have to be considered simultaneously to arrive at the optimal marketing mix. Marketing management must be prepared to shift the relative levels and emphasis given to price, advertising, product improvement, product differentials, etc. for each stage of the product life cycle. Model builders are continually developing more sophisticated models for use when considering a number of simultaneous changes in the marketing mix.

It may well be argued that while the results of this type of analysis look impressively neat and infallible they are based on purely subjective judgements. However, as Baxter and Oxenfeldt have emphasised, crude

estimates of demand may serve instead of careful estimates of demand but cost gives remarkably little insight into demand. Similarly, subjective judgements of the range of likely outcomes based on the cumulative experience of executives are better than subjective most likely estimates based on the same cumulative experience. If properly explained, marketing executives do understand the profit-volume charts described in this paper. The charts can provide a vehicle for a discussion between accountants and marketing people of the importance of demand forecasts and the development of subjective probabilities. As management becomes more accustomed to attaching subjective probabilities to their demand forecasts and cost estimates, their ability to make such judgements will improve. They are simply formalising something they have always done in decision making: weighing the odds. The fact remains that cost plus pricing procedures can only produce the optimal price by accident.

Accounting Principles: 'Generally Accepted' by Whom?

George Gibbs

The financial world is troubled with problems of communicating both the results of its past activities and its forecasting of the future. Part of this trouble is due to semantics. Accountants are in the middle of the verbal confusion as they must provide the means of interpreting these activities to owners of businesses (corporations, partnerships and proprietorships), to regulatory bodies, to stock exchanges, to government, to financial analysts, to labour unions, to economists, and to all other interested persons. As the provider and verifier of data in a complex world, it becomes necessary for the accounting profession to have and to apply rules of practice in order that each member may produce somewhat similar results under given conditions. The results will never be exactly the same, when the work is done by different persons or firms, because the exercise of judgement is one of the characteristics of a profession. However, there must be unanimity on certain matters in order that the results be understood and accepted within each country and throughout the world.

The accounting profession, in the United States, has long used, in its communication process, the term 'in accordance with generally accepted accounting principles'. This phrase is used in every audit report letter which expresses an opinion that the statements 'fairly present' the financial position of the entity under examination. The phrase 'generally accepted accounting principles' has been parroted for so long that it has become almost meaningless. It would appear that a differentiation between *principles* and *practices* is imperative, and that some of the phrases in the accepted audit report letter need to be changed.

In 1953, A. C. Littleton, Professor Emeritus of Accountancy at the University of Illinois, stated that a principle was 'a crystallisation of ideas into a clear verbal statement of a significant relationship'.¹

At an earlier date, 1938, a monograph was prepared by three other prominent professors, one from California and two from the east coast of the United States, which contained the following definition:

"The principles of accounting are, therefore, the more general propositions describing the procedure which should be followed in the making of records and the preparation of financial statements, if the

functions enumerated are to be properly performed."²

Each of these earlier publications stressed the *principles* as being a body of doctrine which could be used as a basis for intelligently deciding which of the *practices* should be used when there are alternative possibilities.

The concepts presented in the 1938 monograph included materiality, separation of transactions which affect capital from those that affect income, reliability of data, proper allocation of long-life assets over several periods, consistency between time periods and conservatism in treating unforeseen contingencies of an adverse character.³

However, in the voluminous Accountants' Handbook of 1,873 pages, printed in 1934, there is no reference in the index to any of the following: accounting principles, generally accepted, or even principles.

The handbook includes suggested practice without any definitive framework as to why certain practices are more valid than others.

In contrast to the academicians' earlier distinction between *principles* and *practices* one finds a recent publication of the regulatory agency for all California accountants stating that:

"The term 'accounting principles' is construed to include not only accounting principles and practices, but also the methods of applying them."⁴

This inclusion of *principles*, *practices* and *methods*, all under the caption of 'principles', adds to the confusion especially since it now has the force of law in the state of California, the most populous state in the United States.

On the national level the American Institute of Certified Public Accountants has similarly muddled the terminology when the Council (its governing body) adopted in October 1964 a resolution that all pronouncements of the Accounting Principles Board would immediately be deemed to be 'generally accepted' by stating that:

1. "Generally accepted accounting principles" are those principles that have substantial authoritative support.

2. Opinions of the Accounting Principles Board constitute "substantial authoritative support".⁵

This is a two-headed monster. An analysis shows that the 16 pronouncements of the Accounting Principles Board, in the 11 years of its existence, relate mainly to *practices* not *principles*, as defined by the earlier worthy authorities! For example, the recent opinion regarding the treatment of acquisition of the ownership of one corporation by another as a 'pooling of interest' or as a 'purchase' relates to an accounting practice *not* to a principle.⁶

Louis M. Kessler, then President of the American Institute of Certified Public Accountants stated, at the annual meeting held in the fall of 1969 in Los Angeles, that 'There will be forthcoming a statement on the fundamentals of corporate accounting. This is something that should have been done ten years ago, but everybody was too busy putting out fires.'⁷ Presumably Mr Kessler means 'principles' when he mentions 'fundamentals'.

Thus, one sees by the recommendation, the elected leader in the profession that there is need for definition and careful delineation of 'principles'. But who is to do it?

Professor R. F. Chambers of Sydney adds to the problem by reminding that there is a statutory principle binding on all Certified Public Accountants in that the Securities Act of the United States Federal government is charged with regulating the 'affairs and the reporting on the affairs of certain corporations "in the public interest and for the protection of investors"'.⁸

Before the advent of the Accounting Principles Board, the American Institute of Certified Public Accountants published 51 Accounting Research Bulletins between 1940 and 1959. These were approved by the organisation's Committee on Accounting Procedure, but were not issued as formal pronouncements.

It was deemed that eight of the first 42 bulletins dealt with accounting terminology. A codification was made, in June 1953, with the issuance of Bulletin No. 43 which summarised 34 of the series. The essence of the other eight was published as Accounting Terminology Bulletin No. 1.

The terminology bulletin quoted several dictionary definitions. One was that a principle was 'a general law or rule adopted or professed as a guide to action; a settled ground or basis of conduct of practice'. The bulletin concluded that this definition

'comes nearest to what most accountants, especially practising public accountants, mean by the word *principle*. Initially, accounting postulates are derived from experience and reason; after postulates so derived have proved useful, they become accepted as principles of accounting. When this acceptance is sufficiently widespread, they become

a part of the "generally accepted accounting principles" which constitute for accountants the canons of their art'.⁹

In 1965 Paul Grady completed an inventory of 121 items which he called 'principles' when in reality many of them are descriptive of specific practices. Included are the following: 'Costs of intangible items . . . should be shown separately' and 'Investments in affiliates should be segregated from other investments'.¹⁰

George Catlett, a member of the Accounting Principles Board, suggests that the Board should clearly and concisely set forth, on an authoritative basis, the *objectives* upon which to build a foundation, including the purposes of financial statements today . . .

'Then the basic concepts and *principles* necessary to carry out the objectives would be established.

After that, the appropriate *practices* and methods would be determined on the basis of the principles involved in each of the problem areas.

The arbitrary criteria and *rules*, to the extent necessary for a reasonably uniform application and implementation, would be indicated, but these would be kept to a minimum and identified separately from the principles'.¹¹

These four italicised words would form a systematic framework for an accounting system designed in a logical manner. While accountants have been extremely logical in the development of the details of certain *rules* that determine *practice* they have been illogical in developing the system based on the objectives. At least agreement to use the key words in this outline would be helpful to improve communication. Mr Catlett deems that this programme is very vital and concluded that 'The accounting profession has a tremendous opportunity to be of constructive service to our society for a long time to come . . . and this cannot be accomplished without better objectives'.

In a personal letter in 1969, Professor Chambers, author of *Accounting Evaluation and Economic Behaviour*, stated that he avoided the word 'principles' because it has been so misused in the past and is still misused in the present. He also said that 'The basic principles really are only principles of intelligent behaviour'.¹²

Professor Gerhard G. Mueller of the University of Washington stated, in 1967, that the principles exist as a 'set of pragmatically evolved rules', but that the principles have never been defined by any professional body or government agency in the United States.¹³

Certain of what the present writer calls 'principles' have been called by other names, for example:

(a) *Doctrines* include conservatism, consistency and materiality.¹⁴

(b) *Standards* include relevancy, verifiability, freedom from bias and quantifiability.¹⁵

(c) *Guidelines* for communication include appropriateness, disclosure, uniformity and consistency.¹⁶

(d) *Postulates* include continuity, objectivity, consistency and disclosure.¹⁷

(e) *Concepts*, considered in 'determining what is acceptable' include consistency, materiality and full disclosure.¹⁸

(f) *Principles* include the distinction between capital and income (determination of income), going concern, disclosure, materiality, consistency and conservatism.¹⁹

A summary of these examples of different words used to express a common idea, shows that certain principles appear throughout. Thus, one can conclude that the essential elements might include:

- Appropriateness
- Conservatism
- Consistency
- Continuity
- Determination of income
- Disclosure
- Materiality
- Objectivity
- Quantifiability
- Uniformity.

This list shows that different authorities in the field have had similar thoughts even if they used different words to express their ideas. There is not space here to develop the meaning of each of the essential elements above. There are some inconsistencies between certain items, but sufficient evidence is offered by acknowledged authorities to show the necessity of distinguishing between a principle and a practice.

Some of this discussion has been a digression from the main purpose which was to examine the following question: Who are the people and institutions who have *accepted* the principles or practices as valid and useful, and when is there enough acceptance for them to be deemed 'general'? However, the digression was warranted because in order to determine the general acceptance of anything it is essential to determine what it is that is being, or not being accepted.

In contrast to the definition, in the Terminology Bulletin No. 1, which involved widespread acceptance, 'generally accepted accounting principles' have been incorporated into the ethics of the American Institute of Certified Public Accountants with a flat statement that 'a member may be guilty of an act discreditable to the profession if . . . (e) he fails to direct attention to any material departure from generally accepted accounting principles . . .'.²⁰

Commenting on Section 2.02 of the Code of Ethics

regarding any 'material departure from generally accepted accounting principles' a prominent worldwide firm has stated that:

'Great emphasis has thus been placed on generally accepted accounting principles. However, there have never been any comprehensive and authoritative pronouncements that have been *accepted in industry or in the accounting profession* as to the accounting postulates, concepts or standards that underlie the accounting principles referred to in auditors' opinions.'²¹

While one could state unequivocally that the American Institute of Certified Public Accountants had adopted the idea of generally accepted accounting principles when one comes to discuss *what* these principles are an impasse is reached.

In contrast, The Institute of Chartered Accountants in England and Wales has no requirement that reference be made, in the auditor's report, to 'adherence to generally accepted auditing standards or to conformity with and consistency of application of generally accepted accounting principles'.²²

The requirement to disclose any material departure from generally accepted accounting principles which are not clearly designated, has caused many to ponder, but even more important is the fact that while some accountants think that the 'generally accepted' refers to general acceptance by accountants *only*, others think it means acceptance by all interested parties in the economy.

A suggestion that 'acceptance' of accounting principles had evolved like certain legal principles was made by Weldon Powell, then a partner of the firm of Haskins and Sells, in an article first published in *Die Wirtschaftsprüfung* of February 1964. His statement was that generally accepted accounting principles 'have evolved through years of practice, not unlike the evolution of the common law'.²³

Herman W. Bevis, the recent chairman of Price Waterhouse & Co, wrote five years ago in 1965, that, as far as corporate accounting is concerned, when the Accounting Principles Board, the stock exchanges and the Securities Exchange Commission 'reach agreement on some aspect of financial accounting and reporting, the conclusion rapidly achieves general acceptance'.²⁴

This seems to be a much more meaningful use of the words 'generally accepted' than the use attached to each Accounting Principles Board opinion today. The American Institute of Certified Public Accountants assumes that generally accepted accounting principles are 'principles that have substantial authoritative support' and that the 'opinions of the Accounting Principles Board constitute substantial authoritative support'.²⁵

Mr Bevis, a member of the Accounting Principles Board for several years, gives a warning that the result of the American Institute of Certified Public Accountants' Council action, in 1964, in making the Accounting Principles Board opinions 'generally accepted' and requiring disclosure of any material departures in the auditor's report letter, will be that the Accounting Principles Board 'will be more cautious than otherwise in stepping out of current accounting thought and practice in an attempt to set direction and pace'.²⁶ This is unfortunate just when the accounting profession should be taking the lead in providing better presentation and analysis of at least the quantitative aspect of the economic activities in society. Better accounting practices are needed for all segments of society, especially government at all levels, and the tax exempt 'non-profit organisations'.

It would therefore seem to be in order to suggest that a distinction be made between written rules of the American Institute of Certified Public Accountants and 'generally accepted accounting practices'. If this were done then probably the Accounting Principles Board should change its name. Probably the auditor's report letter should be reworded. This is one place where the idea of *uniformity* should be dropped. There probably should be more variety in the letter in order to explain the significance of the result of the auditor's work.

The very fact that the phrase 'generally accepted' has been used indicates there must be some persons who have *not* accepted, otherwise the principles would be subject to *complete* acceptance.

If there are alternative practices and the significance of these alternates is disclosed, the reader will be informed and be enabled to draw adequate conclusions. In the case of corporations it may be necessary to present *more than one* figure for income per share, each based on certain different but disclosed assumptions. Some of these assumptions involve estimates of the future despite the fact that accountants do not have a crystal ball. Examples which require the use of judgement are inventory pricing, length of life for depreciable assets, allowance for bad debts, future

value of purchased goodwill and value of patents and other intangibles. If the bases of valuation are adequately disclosed and alternative figures presented, where alternative practices yield material differences, then the accountant has made a real contribution and would be following 'world-wide generally accepted accounting practices'.

In an interesting booklet, first published in 1950, entitled 'Audits by Certified Public Accountants', which many practitioners present to new clients in order to acquaint them with the audit function, is the statement that:

'The CPA is responsible for reporting any exceptions clearly and unequivocally whether they involve . . . the soundness of the company's accounting practices . . . or lack of consistency in the application of accounting practices'.

Thus it was that *soundness* and *consistency* of application of practices counted twenty years ago. Some practitioners think they still do today, and that what is of greatest importance is the generally accepted *practices*, with the principles used as criteria.²⁷

This survey brings out several points, first that the list of generally accepted accounting principles is *not* agreed upon; second, if the use of the word *principles* in the report letter is continued to designate the result of the choice of alternatives, then it is the underlying *concepts* or *standards* which will provide the guides for the choices. This writer prefers to suggest a reconsideration of the words in the required standard audit report letter. A revision of the letter should briefly define the relevant *principles* and relegate the word *practice* to its proper place. As the principles are underlying the financial reporting of all economic activity, not just the business segment, they would also be applicable to financial statements of governmental bodies and non-profit tax exempt organisations. The practices will vary, but the principles will not.

It is the *results* that are significant and these results should be 'judged from the standpoint of society as a whole—not merely from that of any one group of interested persons'.²⁸

References

¹ A. C. Littleton, *Structure of Accounting Theory* (Evanston, Illinois, American Accounting Association, 1953), p. 23.

² Sanders, T. H., H. R. Hatfield and U. Moore, *Statement of Accounting Principles* (New York, American Institute of Accountants, 1938), p. 5.

³ *Ibid.*, p. 113.

⁴ California State Board of Accountancy, *Notice to Licensees Concerning Rules 58.1 and 58.2*, California Office of State Printing, January 1970, p. 13.

⁵ Arthur Andersen & Co., *Accounting and Reporting Problems of the Accounting Profession*, 3rd Edition (Chicago 1969), p. 1.

⁶ American Institute of Certified Public Accountants, Accounting Principles Board, 'Business Combinations and Intangible Assets' (New York 1970).

⁷ Remarks of Louis M. Kessler, *Los Angeles Times*, 6 October 1969, Part III, p. 14.

⁸ R. J. Chambers, *Accounting, Finance and Management* (Sydney, Arthur Andersen & Co, 1965), p. 244.

⁹ American Institute of Certified Public Accountants, *APB Accounting Principles*. Two Volumes (Chicago, Commerce Clearing House, Inc, 1968); Vol. 2, p. 9505.

¹⁰ Paul Grady, *Inventory of Generally Accepted Accounting Principles for Business Enterprises*, Accounting Research Study No. 7 (New York, American Institute of Certified

Public Accountants, 1965), p. 259.

¹¹ George R. Catlett, *Better Objectives Needed to Improve Accounting Principles* (Chicago, Arthur Andersen & Co, 1969), p. 10.

¹² Letter to the writer from R. J. Chambers, Sydney, dated 20 August 1969.

¹³ Gerhard G. Mueller, *International Accounting* (New York, MacMillan, 1967), p. 63.

¹⁴ William J. Vatter, 'Postulates and Principles', *Journal of Accounting Research* (I, Autumn, 1963), p. 196.

¹⁵ American Accounting Association, *A Statement of Basic Accounting Theory* (Evanston, Illinois, 1966), p. 7.

¹⁶ *Ibid.*, p. 7.

¹⁷ Robert T. Sprouse and Maurice Moonitz, 'A Tentative Set of Broad Accounting Principles', *Accounting Research Study No. 3* (New York, American Institute of Certified Public Accountants, 1962), p. 7.

¹⁸ Thomas R. Prince, *Extension of the Boundaries of Accounting Theory* (Cincinnati, Ohio, Southwestern Publishing Co, 1963), p. 57.

¹⁹ George Gibbs, *Accounting for Management Decisions*

(Scranton, Pennsylvania, International Textbook Company, 1969), p. 63.

²⁰ American Institute of Certified Public Accountants, *Code of Professional Ethics* (New York, as amended 30 December 1969), p. 3.

²¹ Arthur Andersen & Co, *op. cit.*, p. 1.

²² American Institute of Certified Public Accountants, Committee on International Relations, *Professional Accounting in 25 Countries* (New York 1964), p. 19/14.

²³ Weldon Powell, 'Generally Accepted Accounting Principles in the United States' *Selected Papers 1963* (New York, Haskins and Sells, 1964), p. 14.

²⁴ Herman W. Bevis, *Corporate Financial Reporting in a Competitive Economy* (New York, MacMillan, 1965), p. 190.

²⁵ AICPA, APB Accounting Principles. *op. cit.*, p. 6621.

²⁶ Bevis, *op. cit.*, p. 190.

²⁷ American Institute of Accountants, *Audits by Certified Public Accountants* (New York 1950), p. 16.

²⁸ Leonard Spacek, *A Search For Fairness in Financial Reporting to the Public*, *Selected Addresses 1956-69* (Chicago, Arthur Andersen & Co, (1969), p. 87.

The Scope of the Company Audit

Peter Bird

Introduction

Dissatisfaction with the present state of company auditing has been widely publicised in the financial press during the last year. The criticism has concentrated on two issues – doubts about the effective independence of reporting auditors and the wide range of alternative practices (and alternative profit measures) which fall within the bounds of accounting principles with which the auditors are reporting compliance. These issues are important and anxiety about present practice with regard to them is fully justified. But if acceptable solutions were found to these problems, the investment community would still not agree that the auditor was fulfilling his functions adequately. For there would still remain the question of the scope of his examination and report.¹

The dissatisfaction here is less clearly defined, but was well expressed by Sir Donald Perrott in a paper to an Institute Summer Course as long ago as 1961.² 'The audit does no more than certify that the balance sheet is a true and fair balance sheet; whether the company has been well run or not, whether there is concealed behind the profits earned (or losses sustained) negligence, bad judgement or even incompetence, will not necessarily be disclosed.'

A Companies Bill introduced into the House of Commons in 1969 as a private members' bill sought to give power to a shareholders' representative committee to require the directors of a company to allow a management audit. Section 6 (1) of the Bill defined a management audit as 'an inquiry into the advisability of any of the policies of the directors in furthering the objects of the company as defined in the memorandum, or into the efficiency with which they are securing the execution of those policies'. Sir Brandon Rhys Williams, who introduced the Bill, explained the thinking behind it in a letter to *The Times* of 15 September 1969: 'Shareholders cannot any longer form an accurate assessment of the efficiency and probity of their company's management simply on the figures. In this situation traditional accountancy

inevitably falls short of what the shareholders require of the men they employ to conduct the annual audit. . . . The need is for the extension of the area of generally approved codes of practice into aspects of business outside the present range of accounting procedures. Many more of the decisions now left entirely at the discretion of management should be taken – and judged – by the light of tried and accepted professional standards.'

The purpose of the present paper is to examine this claim that shareholders should receive audit reports based upon wider examinations than at present; to consider the nature and limits of the additional management audit; and to consider who is best fitted to undertake this additional examination and reporting.

The purpose of an audit

In considering what is the proper nature and extent of an audit in the particular context of a British company today, it is first necessary to examine what in general terms is the purpose of an audit. Whenever the owners of resources place some of their resources into the hands of others as managers or stewards, they hold the latter accountable to them. Such owners may be shareholders, club members, citizens, lords of the manor – the situation is not limited in context or even in political philosophy. Accountability is satisfied in two parts; the party accountable makes a report (primarily of a financial nature) to the owner, and then allows the owner to audit or have audited his activities. The auditor's task is to come to an opinion whether the report presented by the steward reflects what has actually happened in accordance with principles agreed between the interested parties.

The application of these ideas to business enterprises with multiple private ownership is necessarily of relatively recent origin, though early in the development of such enterprises. But 'the idea of accountability is perhaps as old as organised government'.³ The city states of classical Greece regarded the sub-

jection to audit of all office holders as an important feature of their system of government. Aristotle viewed the 'calling to account' of officeholders as the main instrument whereby the deliberative element, the people as a whole, is made sovereign while offices are held by the nobles or meritocrats.⁴ He noted that if the latter are truly noble they will welcome this check upon them.

When Solomon's temple was repaired 'they did not ask an accounting from the men into whose hands they delivered the money'.⁵ Clearly this was an exception to normal practice such that it was worthy of note in the narrative.

The proper scope of an audit depends upon the standards of performance expected of stewards by owners of resources; that is, in the context we are concerned with, the standards expected of directors and management by shareholders and their advisors.

Note in passing that the British are right to give to shareholders the exclusive right and duty of appointing and removing company auditors, receiving their report and determining their fees. Auditors of United States companies may report to the Directors, or the Directors and Members or to the Members. Any formal relationship between the auditor and the directors serves to prejudice the auditor's appearance of independence and confuses the auditor's duty. He cannot serve two masters and his duty is to the shareholders or other owners. The public interest is better served by making this clear than by confusing statements about being fair to all interested parties.

Stewardship standards

What do owners expect of stewards? In ascending order I suggest:

- (a) that stewards should not use resources for their personal use or profit;
- (b) that stewards should not use resources in a manner contrary to instructions issued to them;
- (c) that stewards should use resources so as to generate a reasonable return on them.

This last is the standard which has determined the form of company accounts and audit reports today. But there is a growing belief by, and even more on behalf of shareholders that company directors are responsible as stewards for managing the resources entrusted to them with maximum efficiency. The volume of support voiced for the intentions, if not for the provisions, of Sir Brandon Rhys Williams's Companies Bill 1969 is some measure of the emergence of this new standard.

Since the scope and nature of auditing is determined by the standards of accountability ruling in a particular environment, the appearance of a new standard will usually call for an adjustment in the

audit. It is the auditor's duty to examine compliance with standards of accountability as they are imposed upon him.

But standards may be proposed with which it is impossible to verify compliance. The presently emerging standard is ill-defined, but at its most naive demands optimisation in policy and execution. The Companies Bill 1969 is phrased so that it seems to set this standard. But, while it may be possible in some circumstances to say with conviction 'could do better', full knowledge is never possible concerning what might-have-been if different policies had been pursued. Such a 'standard' is nothing more than an invitation to an auditor to set up his business judgement in rivalry to that of the directors. A further problem with an optimisation standard is that everyone falls short of it; inefficient firms are less conspicuous when all are branded as sub-standard.

A management systems audit

But it would be possible to extend audit scope so as to satisfy partially this desire by shareholders for assurance that their resources are being managed competently. Auditors could agree upon standards for systems of planning, review and control, and they could then report whether a company measures up to minimum satisfactory standards in these respects. The standards would have to vary with scale of the company's operations; the auditor's professional judgement would have to determine what degree of sophistication could reasonably be expected in any specific organisation.

To illustrate this proposition, consider the decision to invest in new plant. It is not reasonable to expect an auditor to report whether the directors have a flair for picking the right moment for the right purchase. But it is reasonable to ask him to report whether the directors have set up adequate procedures for regular generation and evaluation of possible plant investment. Again, if several key personnel are approaching retirement age, do not ask an auditor to tell the shareholders if he thinks their successors designate are big enough for the jobs. But let us ask the auditor to report if he finds that no thought has been given to finding successors for these important posts.

A regular Wage Audit is being urged on the clients of a Consulting Group.⁶ This does not mean in this context checking the insurance cards; it means 'a regular annual audit by independent outsiders, subjecting the whole field of pay and related benefits to the sort of scrutiny that ordinary auditors by law apply to a firm's finances'. If 'ordinary auditors' do not want to equip themselves to carry out this sort of review they ought at least to be ready to report where

a client is failing to use specialist services which he needs.

It looks as though this is a recommendation to wash a lot of dirty linen in public. But publication of deficiencies could be reserved as a sanction for deliberate refusal by the management to comply with the auditor's required standards. Qualification of the audit report on the management systems of the business will usually be avoided by remedial action, just as qualification of the opinion on the accounts is often avoided by amendment of the accounts to remove those features to which the auditor takes exception.

So in the first instance, advice on management systems would be addressed to the directors, as an integral part of the audit and without prejudice to the auditor's duty to serve the shareholders. This is the best of both worlds.

How should such a management systems audit be initiated? The Companies Bill 1969 proposed first that every annual general meeting should consider the appointment of a shareholders' committee which would have power to commission a management audit. This was later amended so that the item would only appear on the agenda for the annual general meeting if at least 5 per cent of the shareholders asked for it.

Neither of these versions overcomes the problem that the shareholders, and any shareholders' committee for that matter, do not know when there is a serious degree of inefficiency in their company. The management systems audit must therefore be a regular annual review on the pattern of the financial audit. This would have the added advantage that no individual boards of directors would feel insulted or mistrusted as they might if the procedure had to be explicitly triggered off.

The management systems auditor

The cost of such a review annually for every company (or even for every public company only) might seem prohibitive. It might well be high, especially if it was carried out as a separate operation by management consultants (the course which Sir Brandon Rhys Williams, a management consultant himself, seems to envisage). Even then the increases in economic efficiency resulting from, or made in anticipation of, these reviews, could make them an investment with a high rate of return. The cost however would be less if the systems review was carried out by the professional accountant who is auditor of the financial statements. This auditor has the task of reporting an opinion on the accounts; but in his examination of the accounts he is closely involved with many aspects of the management systems. Sir Brandon Rhys Williams

himself has written 'Frequently the auditors are the first to detect that a firm is operating to less than maximum advantage; but it is not their business to say so. I believe this restriction on the activities of the auditors is an unnecessary hangover from nineteenth century practice which ought now gradually to be removed.'

Professional accountants first became concerned with their audit clients' systems at a clerical control level. To reduce their audit workload to bearable proportions where the volume of transactions was large, auditors placed such reliance as seemed warranted on the clients' systems of internal control. Auditors may convey to the management of client companies recommendations for improving their control systems that have come to their notice during their audit. These recommendations are passed to the management for two reasons; first, because next year's audit will be easier if the recommendations are accepted; secondly, because management may appreciate such positive advice, and the professional accountants who give it, in a way that they never appreciate the receipt of a single paragraph of audit opinion.

The extension of audit scope which has been suggested gives a much clearer basis for the involvement of the auditor with the client company's management systems. It also gives a clearer limit to the involvement. At present we know that auditors are concerned if the company has no system for making it difficult for one of the staff to appropriate the company's cash. But is it now a part of the auditor's task to consider whether the company has plans for profitable use of short-term surplus cash and whether it makes cash budgets far enough ahead to avoid being taken by surprise by sudden cash shortages?

Professional accountants must fix the limits of the new audit, and fix them at the extent of management systems for which standards can be agreed. If they fail to take this initiative, a Companies Bill like that of 1969 may one day become a Companies Act and burden them with responsibilities impossible for them or any professional person to accept.

It may be objected that many auditors have not the skill and expertise to judge management systems. It is easy to overstress this ignorance. Professional accountants have been working very close to this area for a long time. The audit process is the same as for the review of the accounting statements. A few new techniques must be assimilated — but all are child's-play to an accountant who has lived through the Finance Act 1965. If they fail to gain the necessary expertise, there are management consultants and persons bearing banners with many strange devices who are prepared to meet this demand from shareholders. The accountants would then be left with the

audit of the accounting statements only – if they could restore public confidence in the accounting principles embodied in them.

A clear distinction needs to be drawn between such an extension of audit scope and any form of consultancy service to the company. A consultant advises the company on the course of action he considers to be the best in the circumstances. An auditor, of accounts only as at present or of accounts and management systems, reports whether these, as set up by the company, come up to a predetermined minimum standard. He is not required to say that this is the way he would have acted if he had been given executive responsibility in the matter. The consultant's goal is optimisation, but the auditor seeks merely a level of satisfying behaviour from the company.

A revolutionary proposal ?

The practising accountant has an established position as the 'general practitioner' adviser to business. It is part of general practice to know what specialist skills exist and when a client has need of them. Some he can provide himself – in taxation and, it is asserted, in management systems generally. Other skills must be provided by specialists in insurance, pensions, stock markets, work study, production engineering – perhaps wages audits. It is not a revolutionary but an evolutionary change in auditing for the auditor to have a duty to report if a client refuses to employ or consult specialists who, in the auditors' judgement, are necessary to the responsible conduct of the business and so to the proper stewardship of its resources.

Two features of this proposal seem new: (1) the idea that an external company auditor should report on matters which are not explicitly stated by the parties accountable and (2) the idea that they should report on aspects of management systems. In fact it is not entirely novel to ask a 'professional' auditor to state an opinion on implied statements. The company auditor is responsible for reporting if proper books of account have not been kept, but the company directors are not required to assert that they have been kept.

But neither of these features seems as strange if we look at two other streams of auditing activity, which are usually ignored by 'professional' auditors, that is, internal auditing and government auditing.

Internal auditing can mean almost anything, but rarely does it have a set of accounting statements as its starting point. More often it starts only with a manual of company procedures – a 'house' version of the systems standards we are seeking for external auditors. At its most positive internal auditing, preferring the title operational auditing, shades into Organisation and Method, 'You don't really need to distinguish between operational auditing and O & M. The oper-

ational audit checks on whether what should be going on really is going on. It doesn't put in systems, it examines them.'⁸ This sounds very much what has been proposed for external auditors, except that its internally developed standards are more easily agreed than those on a national scale which the latter needs.

Parliamentary systems auditing

Government accounting is mainly on a cash basis, so that the complexities of balance sheet asset valuation are not important. Perhaps this is why the development of stewardship ideas that is here envisaged for the private sector took place long ago in the context of examination by the Comptroller and Auditor-General (C & AG), on behalf of Parliament, of spending by Government departments and other bodies dependent on public funds. Ever since the Exchequer and Audit Department Act 1866, this officer of Parliament has been required by statute to satisfy himself 'that the money expended has been applied to the purpose or purposes for which grants made by Parliament were intended to provide and that the expenditure conforms to the authority which governs it'. But before the end of the nineteenth century the C & AG was interpreting his brief very widely. This caused a succession of battles with the Army and the Navy, in which the C & AG was supported by the Public Accounts Committee of the House of Commons.

The C & AG enquired (1887) why the War Office placed a contract for ribbon for 20s after cancelling another supplier's contract at 14s. The War Office reply was that the C & AG was not authorised 'to enter upon matters of administration'. But the Public Accounts Committee pronounced 'If, in the course of his audit, the C & AG becomes aware of facts which appear to him to indicate an improper expenditure or waste of public money, it is his duty to call the attention of Parliament to them.' By 1911 this point was finally conceded by the military departments. In the course of the dispute the Public Accounts Committee noted that 'the differences between the cost of similar ships, according as they are built by the Government or by the trade, or in one Government yard rather than in another, are matters of much public interest, and the C & AG was clearly within his right when, in the exercise of his discretion, he called attention to them.' Perhaps of even more general significance is its observation that 'the assistance afforded by a thorough system of audit deserves a welcome that it does not always receive from those who are responsible for administration'.

Since 1939 the emphasis in the work and reports of the C & AG has moved strongly from regularity to

system efficiency. 'Cases of pure regularity have now become a rarity. The basis question being asked has ceased to be "Was this payment duly authorised and properly accounted for?" and is now "How did the Department satisfy itself that the price paid was fair and reasonable?"'⁹

An interesting illustration of the difference between the extent of the statutory duty and of the actual review of the C & AG is provided by the recommendation of the Public Accounts Committee of 1966-67 that 'the C & AG should be given access to the books and records of the UGC (University Grants Committee) and the universities.'¹⁰

The C & AG can in fact fulfil all his statutory responsibilities in connection with the Vote for Universities without having access to the records of the UGC or the universities. He can satisfy himself from records of the government that the money has been 'applied to the purpose . . . for which grants . . . were intended to provide', that is, for university development; and that 'expenditure conforms to the authority which governs it', that is 'that only those departments and men who are authorised to spend funds do so',¹¹ in this case the UGC. 'But the Auditor-General is now expected and encouraged to cast his net wider. When his staff have seen the books and other documents relating to a transaction, . . . they may be quite satisfied about its formal regularity and yet they may come to the conclusion that it was not handled very prudently or expeditiously or even that it definitely involved waste and inefficiency.'¹² The reports on matters of the latter nature by the C & AG to the Public Accounts Committee have no statutory authority. But the Committee recommended that the C & AG should have access to University records 'for general and independent examination by the C & AG, which is addressed rather to general efficiency than to detailed regularity'.¹³ In oral evidence to the Public Accounts Committee the C & AG indicated what would be within the scope of his audit if he were given access to university records: 'To examine, assess and, if necessary, report to Parliament and to this Committee on the efficiency and completeness of the procedures and controls exercised by the Department [of Education and Science], the University Grants Committee and the universities. This assessment of the methodology, to use an ugly but convenient word, would be my primary business.'¹⁴

The system and its output

If 'professional' auditors undertook a similar function they, and the readers of their reports, would need to make a clear distinction between the system or

methodology – which would be the subject of the audit opinion – and the output of the system. No audit opinion is stated about the latter since it is dependent upon unverifiable inputs as well as upon the system itself. But this distinction needs to be made in some circumstances even now. Chartered Accountants are prepared to issue reports on profit forecasts, under the terms of paragraph 15 of the City Code on Takeovers and Mergers (April 1969) or otherwise. Statement S15 of the Institute of Chartered Accountants draws the distinction thus:

'Profit forecasts necessarily depend on subjective judgements. . . . In consequence profit forecasts . . . are not capable of confirmation and verification by reporting accountants in the same way as financial statements which present the final results of completed accounting periods and there is no question of their being "audited". . . . Reporting accountants can, however, within limits properly undertake a critical and objective review of the accounting bases and calculations for profit forecasts.' (Paragraphs 4-6.)

The distinction to be made here is more difficult, at least for the reader of the report, than that between general administrative systems and their outputs which needs to be made in connection with the proposed extended company audit.

Conclusions

Stewardship standards expected of directors of British companies have risen recently. The scope of audit examinations and reports should be extended to review compliance with the new standards. This cannot be achieved until these new standards are developed from their present aspirational terms into agreed minimum levels for management systems efficiency. Company auditors have much to learn from internal auditors and the Comptroller and Auditor General in this development.

The additional management systems audit of companies should be a regular annual event, since shareholders do not have the information on which to base a demand for it as a special assignment. Systems deficiencies should be publicly reported only if directors fail to implement recommended improvements. The additional audit should be carried out by the auditors of the company's accounts, who should already be undertaking a large proportion of the work needed to reach a professional opinion on the management system. Care is needed in the phrasing of the report to make clear that, as with profit forecasts, the accountant is reporting only upon the systems employed, and not upon the reliability of the results of use of the systems by the directors.

References

¹ This article is based upon papers presented at the conference of the Cornwall and Plymouth Society of Chartered Accountants, St Austell, November 1969 and at the Accounting Staff Seminar of the London School of Economics, January 1970. The contribution to the development of the article of these discussions is gratefully acknowledged.

² Sir D. Perrott 'What the Business Man Expects of the Practising Chartered Accountant', *Accountancy*, April 1962.

³ E. L. Normanton, 'The Accountability and Audit of Governments', p. 3.

⁴ Aristotle, 'The Politics', 1298a, 1318b.

⁵ 2 Kings 12, 15, RSV.

⁶ *Times Business News*, 3 November 1969.

⁷ Sir Brandon Rhys Williams, 'More Power to the Share-

holder?', *Journal of Business Finance*, Vol. 1, No. 1, p. 60.

⁸ Fred Miller, general auditor, ESSO, quoted in *Times Business News*, 17 November 1969.

⁹ E. L. Normanton, 'The Accountability and Audit of Governments', p. 109.

¹⁰ Special Report from the Committee of Public Accounts, 1966-67, Parliament and Control of University Expenditure, HC 290 of 1966-67, para. 32 (1).

¹¹ B. Chubb, 'The Control of Public Expenditure', p. 53 footnote.

¹² Sir Herbert Brittain, 'The British Budgetary System', pp. 260-1.

¹³ HC 290 of 1966-67, *op. cit.* Report, para. 14.

¹⁴ *Ibid.*, Minutes of evidence Q585.

The Nature of Profit

Harold Edey

Recent discrepancies in profit figures reported by different managements with regard to the same transactions have led to increasing advocacy of the view that the rules of computation of company profits should be standardised, and further, that the bases used and assumptions made in particular cases should be stated, so that those who rely on the figures can draw their own conclusions.

The case for disclosure of basic methods and assumptions seems indeed unanswerable. However, in the discussion that has taken place there have been indications of a belief in some quarters that a method of accounting can be found – perhaps by suitable research – that, if applied in any given case, will produce a unique and objectively determined ‘correct’ or ‘true’ figure of profit. It is the aim of this paper (which contains little that is new) to show that this belief is fallacious and to suggest that thought and effort on the reform of company accounts would be better directed towards defining and improving the quality of the various pieces of information that they contain, on which useful analysis can be based, than in attempting to establish a formula for the calculation of ‘true’ profit.

The uses of profit statements

Profit calculation is not based on a law of nature. It is a human activity, carried out for a human purpose. The method used, and the kind of assumptions on which the calculation is based, should be determined by the end desired. The first step in a discussion of the bases of profit calculation is, therefore, to ask why the measurement is wanted. If an aim or aims can be clearly established, the next step is to consider what kind of figures, and how calculated, are likely to achieve these aims. The rules of calculation – the accounting procedures – that seem likely to do the best job can then be formulated.

However, it does not follow that all the objects desired can in fact be achieved. Some of the disappointment with accounting statements that at present exists is almost certainly due to expecting more of them than they can in their nature give. The onus is therefore upon accountants to be clear in their own minds about the meaning of their profit statements, and to draw attention with force and clarity to the nature, significance and limitations of their figures.

The accounting aims to be considered here are those that arise out of the company-shareholder relationship. The objects of company accounts are from time to time said, explicitly or by implication, to fall under one or other of the following heads: to enable shareholders or other investors to form a realistic view of the value of a company's shares – this may be called the ‘share valuation’ aim; to enable investors to judge the efficiency of the directors – the ‘measure of management success’ aim; to provide shareholders with an account of stewardship and determine how much can properly be distributed in dividend – the ‘stewardship’ aim. These aims to some extent overlap, but it is helpful to distinguish them for the purpose of discussion.

It is not necessary to decide whether company accounts are for shareholders only or for all investors, since all shareholders are investors and they (or their financial advisors) can be presumed to need the kind of information that other investors also want. In this paper the word ‘investor’ will do service for both. Moreover, discussion of the basis of profit calculation has as much relevance to profit forecasts, which may be intended for investors other than the present shareholders of the company concerned, as to statements for past periods.

Share valuation

As any reader of the financial press knows, daily use

is made of figures of reported profit, alone or as an element of a price-earnings ratio, as evidence in deciding the value which it is suggested buyers or sellers should place on the shares of the company concerned. The way in which these matters are presented in the press, in stockbrokers' circulars, and the like suggests that some analysts at least assume that past profit reports have – or can have – a strong predictive value with respect to future benefits from holding the shares in question. There is, so far as I know, no empirical evidence that this is true in general. (Perhaps the best negative evidence is the relative scarcity of millionaire accountants.) This paper, however, is concerned with the rational basis for such a belief. To examine this it is necessary to start by considering what it is that determines the market behaviour of investors.

The price which a person is willing to offer or accept for a share in a stock exchange transaction or in a private deal normally depends, so far as the attributes of the share are concerned, upon his expectation of benefits which the share is likely to yield in future, and upon the degree of certainty with which he holds that expectation. The benefits expected normally comprise one or more of the following: a flow of dividends; a dividend in liquidation or a receipt in a capital reduction; the proceeds of a sale when the investment is finally realised. The benefits expected under one or more of these heads, taken together, comprise the cash flow which the investor hopes for from his investment. (The benefits may, of course, be subject to tax, depending upon the tax status of the investor; but this is a separate question.)

Insofar as such a cash flow includes future proceeds of realisation, its amount will depend upon someone's expectations of further benefits, as estimated at the time of realisation. It may appear at first therefore that the value of a share can depend, so far as the benefits from holding it are concerned, on nothing more substantial than a chain of expected future realisable values, so that the share value is held up, so to speak, by its own bootstraps. It is true that for a time the capital value of a share can be held up by speculation alone unsupported by realistic dividend expectations, in the sense that the price which a buyer is willing to pay depends upon the belief that others will later buy at a higher price. But in the longer run capital value will not be maintained unless there is a reasonable hope of dividends or capital distributions, as more than one investor has learned to his cost. Expectations of future distributions are therefore the ultimate source of share values.

Insofar therefore as an investor or an investment analyst is acting rationally in regarding the profit figure reported in the company's accounts as a

predictor of share value, logic seems to require – unless perhaps he is concerned merely with short-run price rises which may depend upon the way other people interpret profit figures – that it is because this figure is thought by him to indicate in some way the level of future distributions by the company or changes in the capacity of the company to make such distributions. It is necessary therefore to consider how far this is or can be the case.

In the longer run, the ability of a management to provide dividends or to build up to an ultimate capital return – that is, to provide sooner or later a flow of money or a lump sum payment of money to the shareholder – rests upon the management's ability to generate cash receipts in excess of cash outgoings. This is evidently not necessarily true in any one given year or even over a given number of years, since cash that has been raised by issuing further shares, by borrowing, by realising assets or from previous business operations can, provided the profit and loss appropriation account still has a credit balance, be used to pay current dividends. This is so even at a time when very much larger cash amounts are being spent on extending capital equipment, on development, on expanding working capital, and so on.

If, in the latter case, the expenditure is successful, the fact will be evidenced in due course by a rise in the annual rate of inflow of cash from operations, providing finance for raising of dividends so that they are commensurate with the earlier rise in the amount of the shareholders' resources committed. The profit and loss account will at some time begin to reflect the higher revenue. At this stage the process can be repeated, and so on. In practice the process may be more continuous, with new commitments being made before earlier ones bring in the full annual flow of cash expected from them.

Things may however go wrong. Cash incomings may remain obstinately below outgoings, or be so little above them as to provide an inadequate return on money that could, had an earlier expansion not been undertaken, have been diverted to the shareholders' pockets; or to the extent that the money was borrowed, be inadequate for repayment or at least to justify the risk imposed by the borrowing on the shareholders. In such a case the annual profit figures will, sooner or later, begin to reflect the worsened situation, in that they will fail to rise to an extent justified by earlier capital expenditure and growth in working capital, and may even fall. Sooner or later dividends will fall or fail to rise as originally intended. On the other hand the cash flow may in due course exceed expectations, and the profit figure and dividends rise accordingly.

All this is, of course, commonplace to accountants.

What is crucial, and has received less consideration, is the point of time at which success or failure begins to show in a clear way in the profit figure. This is as important for good news as for bad news, as may be seen by considering the point of view of shareholders who sell their shares.

An extreme example often clarifies a point. One of the worst types of financial failure arises when it is found, from one day to the next, that stock inventories and debtors cannot hope to realise more than a small fraction of their balance sheet worth. It is quite possible for such a situation to be preceded by a series of favourable – perhaps extremely favourable – annual profits, so that the profit figure itself is far from suggesting that cash flows to the company – and thence dividends and share values – are in danger. This message can only get through to the profit and loss account by management anticipation of what is going to happen, leading to the creation of the necessary provisions. The current profit report cannot be better than the management's own anticipations. Hopefully in such an extreme situation there will be evidence on which the auditors can judge that the management are being unduly optimistic, or careless, or fraudulent. This does not alter the fact that the quality of the profit figure as an indicator depends upon someone's opinion with respect to the future – in this case the short-run future; and different people will hold different opinions, with differing degrees of confidence; and they may arrive at conclusions at different points of time.

What is true in the extreme case and in the short run is equally true in the more normal case and in the longer run. The company's flow of cash in the future – on which the future dividend flow and the value of the shares depends – is bound up with the use of the existing set of resources, real, money and human. The only way in which the current reported profit can reflect the future is through the effect on it of someone's expectations of the results of this use – normally the management's since the figure appears in their account. As a matter of book-keeping this happens through the recording of changes in the balance sheet figure of the resources – the 'net asset value' – in the light of those expectations.

To a limited extent present practices and conventions allow this to happen, and indeed require it. If, for example, it has become clear to management that a fixed asset is unable to contribute a return in future that will cover at least its current book value it is (or should be) written down. The profit falls accordingly (if the loss is debited to current profit and not to reserve) and the message is given. If the management are on the ball in their accounting there need be little time lag between the rise of the new

opinion on the asset's value and the effect in the shareholders' accounts. The example suggests, however, how limited is the scope of the present profit and loss account in this respect. If an expected fall in future cash flows can be related to a particular asset and is such that the asset will not recover its book value, the effect can be recorded. But none of the following happenings will, in the general way, be reflected in any provision or in the profit balance: (a) a change in expectations with respect to a particular asset that does not bring the present value of that asset below its balance sheet value; (b) a change in expectations that reduces the present value of an asset that has not been recorded in the balance sheet at all, though hitherto it has been thought to have significant earning capacity; this includes a loss in general earning capacity that does not call for a reduction in the value at which particular assets are recorded in the balance sheet, that is to say, a fall in the present value of goodwill; (c) a change in expectations that raises the present value of a particular asset, or the net assets as a whole including goodwill, above the conventionally acceptable figure for balance sheet purposes.

The kernel of the matter is that a profit figure that reflected changes in future cash flows, and therefore growth (or decay) in the business sense (as distinct from the purely book-keeping sense), would have to be based on an assessment of those very flows – that is to say, on a budget forecast of the cash account of the company for some shorter or longer period. On the basis of this the shareholder could assess for himself the present value of the company's shares. A comparison of the assessment of current value with a similar one made at the beginning of the accounting period would lead to a statement of 'profit'. This would be to assess profit on the basis of an annual valuation of the company (or its shares) as a whole, with all that that implies. Profit in this sense would not be calculated prior to the valuation process, but on the contrary would emerge from it, and would have little relation to profit in the ordinary accounting sense.

This is not to say that annual accounts in their present form, and based on the present type of assumptions, have no relevance in judgement of future cash flows or of share values. A consideration of the basic information needs in the process of share valuation does, however, demonstrate the severe, and to a considerable extent, arbitrary, limitations of the profit figure as at present conceived – limitations that would persist even if rules of procedure were completely standardised – as an indicator of future growth; and it shows too the dangers in the present extensive and loose use of figures of earnings per share and

price-earnings ratios.

It is not even the case that the figure of profit in the annual accounts can be assumed to be a reliable indicator in the sense of always moving up (or down) when a careful management assessment suggests an improvement (or worsening) in future expected dividend flows. It is easy to construct examples to demonstrate this point.

Profit as a measure of management success

It may be said that the usefulness of the profit figure to investors depends upon its quality as test of past management success, rather than upon any ability to predict or suggest the future. This may appear at first a more hopeful line of enquiry, if only because so much accounting literature has insisted upon the objectivity or 'factual' nature of accounting profit as an historical record. It is certainly possible to pick very simple cases where the profit calculation can be made objective and meaningful. The financial success of a once-for-all venture can be demonstrated by totalling the cash payments to and from the owners over the life of the venture; the net difference between these will equal the sum of recorded profits (inclusive of any adjustment on final liquidation). This indeed is true of any completed venture, however long its period; though as the period lengthens it becomes increasingly important, when interpreting the result, to apply price-index corrections so that amounts of cash paid in and cash returned at different dates are brought to a common purchasing power standard; and also to apply a compound interest rate of return test (a 'DCF' test) to allow for the fact that invested resources have an opportunity cost in terms of the interest or profit from other possible uses that have been foregone.

The objectivity disappears, however, as soon as the test has to be applied to a going concern in which a significant part of the cash flow to the owners, on which the test of efficiency depends, lies in the future. At the end of any accounting period there are, in most companies, substantial commitments to the future, the ultimate financial results of which will be decisive in assessing the success of the present management.

It would, of course, be possible to ignore all assets but cash in the closing balance sheet. This would reduce the convention of profit calculation for the business as a whole to the textbook method for very speculative ventures – write off all expenditure as it is incurred and take credit for revenue only when received in cash. This method would come nearer to producing objectivity (though provisions for liabilities

would still have to be estimated), subject to the price-level and discount factor adjustments already referred to; but it would fail to distinguish between managements who had brought their companies to the threshold of a brilliant future from those who had done less well, and thus would fail in its basic object.

The existing conventions of profit measurement do provide for an assessment of sorts of the state to which the company has been brought by its directors at the end of any accounting period. As the preceding section has already shown, however, these procedures cannot, by their nature, provide the kind of assessment of the future that is needed for the purpose under discussion; and so far as they provide any indication of the future of the company, they are not objectively determined, but depend upon management opinion and upon the planning assumptions of management, whether these are explicitly formulated and written down or not (for assets that under one plan are reasonably expected to recover their original cost and more, may, under a different plan, be worth no more than scrap). The difficulty here is not a practical one, but is fundamental, arising out of the nature of the problem. A change in a company's capacity to earn positive cash flows may not be related to any change in the assets recorded in the balance sheet under the present type of convention, and the accepted procedures do not require mention of the director's views on this question. Yet it may be much more significant in judging their relative success than any reported change. The results will no doubt ultimately appear in the published accounts. But by the time that the change in the cash flows affects the accounts significantly, the knowledge of the change may have become available in other ways.

The estimation of future cash flows, including future expected dividends, or even of estimated changes in the value of the concern as a whole, based upon such estimates, seems the only way in which the theoretical measurement difficulty could be met; and since such assessments would be made by management (and are indeed being made by some managements as part of the normal process of management control), the test of management efficiency would be based upon subjective assessments made by the persons whose degree of success was being tested. There seems no way out of this difficulty.

It is tempting to believe that the problem of estimating the potential cash flows of the future, which determine the value which the directors have, so to speak, handed on to future years, could be met by a system of management audit, under which an independent management auditor would assess the correctness of the directors' views on this matter. 'Correctness' has, however, no place here, for there is

no yardstick with which to measure: it is merely one man's views against another's. Such an approach also assumes that someone outside the central management can, in the general case, exercise as good judgement on these matters as members of that management – a view that will be rejected by many.

The conclusion seems to be that accounting profit reports based on anything like the present conventions are not, and probably cannot be more than rough and, generally speaking rather unreliable, gauges of management efficiency; moreover, so far as they do provide such a gauge, there will tend to be a time lag of unpredictable length before the profit figure reflects important changes in the company's circumstances – a lag that may be so great that outside events demonstrate management success or failure well before the accounts give a clear signal.

Stewardship

It is the received view in professional accounting circles that company accounts are accounts of stewardship. Under this view it is the directors' duty to report honestly and fairly to the shareholders what they have done with the shareholders' money. This duty to account extends to explaining what resources have been obtained by issuing capital or borrowing and how these have been used. In its simplest form such an account could well consist of nothing more than a summarised cash account together with a list of liabilities incurred and of real and monetary assets acquired, with no attempt at valuation and no attempt at profit measurement.

This is of course a narrow view of stewardship: it explains what has been done with the owners' resources, but does not show the result of the use. A more demanding idea of stewardship would call for a justification of the use made of shareholders' funds and a statement of the value created by their use. At the limit such a view would require an estimate of the value of the undertaking as a whole at balance sheet date. This comes back to the ideas already discussed in the preceding sections.

Somewhere in between these two extreme views of stewardship is the idea that has emerged and is used in practice. Under this the stewardship account gives from year to year an account of the ownership funds that have been raised and of the obligations that have been incurred, and conveys by means of rough and ready rule of thumb 'valuations' of assets some indication of the resources remaining under the control of the directors. In this account the 'values' shown in the balance sheet are clearly understood by accountants to lack any precise significance when taken as a whole. The most that can be said about them in general is that (if the accounts are properly drawn up)

the value of the net assets recorded is not more than will, in the directors' view, be recovered in future periods, though much more may be recovered. The year to year comparison of this net 'value' (with adjustment for owners' funds paid in or distributed), determines the figure reported as 'profit'.

The auditors report whether the accounts are true and fair. It follows from the foregoing that in this phrase the word 'true' should be read in its restricted sense of 'honest', while 'fair' should be read to mean that the usual rules accepted by accountants have been fairly applied. True and fair accounts are those that have been drawn up honestly and with a reasonable standard of care on the basis of conventions acceptable in current accounting practice, consistently applied. A re-wording of the standard form of audit report on some such lines as these might save much misunderstanding.

The idea of a precise indicator of, or even of a best guess at, the total economic and financial state of the company or of changes in this – the kind of indication that would interest an active investor – plays no part in the conception of company accounts that has led to their present form and nature. This conception was largely formed as the result of nineteenth century legal argument, arising in part from disputes between ordinary and preference shareholders as to the amount of dividends that should be distributed, and the argument was conducted within a narrow interpretation of stewardship. The aim of the judges in laying down the rules for dividend distribution that are now accepted, and on which the present conventions of profit calculation to a large extent depend, seems to have been to arrive at workable and honest solutions to a practical problem, solutions that would respect the rights of shareholders of different classes and of creditors. The judges did not concern themselves with any attempt to arrive at an accurate assessment of the company's current economic worth, or to assess the quality of directors' past performance.

Until 1929 there was no statutory requirement to present an annual profit and loss account, and until 1948 there was no requirement for full disclosure of profit. Until the early 'thirties the whole spirit of accounting practice, backed up by the law, was directed, so far as profit calculation was concerned, to seeing that it had been carried out honestly, under established legal rules, and that there was no over-reporting. It was accepted that 'commercial judgement' must enter largely into profit calculation. It was important that balance sheet asset values should not be over-stated or liabilities under-stated, but understatement of net asset value was another matter: secret reserves were acceptable, even commendable.

A major shift of opinion took place as the result of

the *Royal Mail* case in 1931. It became accepted that the non-disclosure of profit might be as serious an evil as over-statement, especially if profit that would have been reported under the normal accounting procedures was concealed and reported in a later year in order to make things at that later date look better than in fact they were. This led in due course to the present rules regarding reserves and provisions which appeared in the law for the first time in the Companies Acts of 1947 and 1948, the way for these having been paved by the Recommendations on Accounting Principles issued for the first time by the Institute of Chartered Accountants in England and Wales in 1942.

These changes in the law and practice did not – and this is important – impinge on the basic procedures used in the calculation of profit. They merely meant that profit calculated under the practical rules of thumb that had been developed in the nineteenth century was to be fully disclosed. Secret reserves still existed and exist now: assets can be and commonly are recorded at values far below the value which would reasonably compensate the company concerned for losing them; goodwill seldom appears, however good the dividend-paying prospects of the company may be; profit certainly does not in general show the growth in the company's value as a business man would assess it in the process of deciding whether to sell or buy an interest in the company. Nor, for the reasons already discussed, could it do so on any objective basis.

This is not to say that company accounts are useless, and certainly not to say that any attempt at making them more useful is wasted effort. It is however right to assert more clearly, for the benefit of all who use such accounts, their fundamental and unavoidable limitations and at the same time to stress what they can do, and might do even better with some reform. The first and perhaps most important point to be made to the public at large is that no one figure or set of figures appearing in a set of accounts should lead to final conclusions. The function of the accounts is best conceived as that of raising in the minds of those who read and study them useful con-

jectures about the company's financial state and progress – conjectures which can be related to knowledge about the company obtained in other ways and which can lead to further enquiries. The study of accounts should lead to the formulation of questions rather than to answers. Least of all can a firm conclusion be drawn from a price-earnings ratio the denominator of which can, by its nature, be given no precise economic or business significance.

The kind of analysis that can lead to fruitful conjectures is based on the examination of such simple things as changes over time in ratios of current assets to current liabilities and in the respective proportions of stock, debtors and cash in current assets, the relation of loan capital to the total mortgageable value of assets (if it can be ascertained), the growth in sales value and in sales volume over time and changes in this rate of growth. The study of the various elements that make up the profit balance and of their relations to one another, to earlier figures and to various balance sheet figures are of much greater significance than the final balance itself.

It seems to follow from the above that reform and improvement in company accounting should be directed towards helping this kind of analysis by providing well-defined figures on which it can be based. Two matters seem of particular importance. The first is the urgent need to provide, on a systematic basis, information on the effect of inflation on the various elements of the profit figure, notably those relating to stock consumption and depreciation, and indeed more generally to move towards reporting in constant price level terms, even if this is only in the form of supplementary statements prepared on a reasonably standardised basis. The second is the need to move towards the provision, as a matter of course, of clear statements of the bases and assumptions on which the accounts have been prepared. The importance of establishing standard accounting practices lies in my opinion here, rather than in the will-of-the-wisp hope of producing figures of accounting profit that are both 'objective' and 'correct'.

Costs and Returns on Graduates of the University of Bradford

R. K. Khanna and Anthony Bottomley*

Introduction

We have used data on the cost of 'producing' first degree graduates in nine separate disciplines for the academic year 1966-67. These disciplines are: Mechanical, Chemical, Civil and Electrical Engineering, Physics, Chemistry, Mathematics, Statistics and Economics.¹ We have also taken figures for life time incremental earnings for graduates in these same subjects. The resultant costs and returns have been entered into a discounted cash flow analysis covering 48 years (i.e. from 18 to 65 inclusive). The first three or four years comprise the costs of the relevant education. Thereafter, only benefits arise. These are taken as the difference between salaries earned by school-leavers with 'university-entrance qualifications' who do not go to university and the salaries of those who do and who graduate in the disciplines covered in this paper. We discuss costs as they affect one discipline only, Mechanical Engineering, in order to illustrate the methodology. The costs for other disciplines were arrived at the same way and are simply given without elaboration in Table 1. They include a number of additional disciplines for which no returns are available.

I. Costs

Costs were calculated on an *annual* per student basis.

* We are grateful to Michael Shattock for the considerable assistance which he gave in devising the scheme for research covered in this paper.

¹ The University of Bradford runs Sandwich Courses i.e. a *part* of the academic year or *one whole* year is spent outside the university for the purpose of industrial training. Such courses as require a *part* of the academic year in industrial training are 'thin' sandwich courses, of which Mechanical Electrical and Chemical Engineering, plus Mathematics, and Physics are all examples. Such courses have two entries per year. Courses in which *one whole* year is spent in industry are 'thick' sandwich courses, of which Civil Engineering, Chemistry and Statistics are the only examples given here. The duration of a sandwich degree course is four years, unlike Economics where there is no industrial training and where the course lasts for three years.

They were subdivided under the following headings:

- (1) Capital and maintenance costs;
- (2) Salaries of teaching and technical staff and expenditure on teaching equipment and materials;
- (3) Administrative expenditures;
- (4) Library expenditures;
- (5) Student facility, general educational and miscellaneous expenditures;
- (6) Student earnings foregone.

We shall deal with each in turn.

1. Capital and maintenance costs per student

These costs comprise annual interest and amortisation on buildings, non-teaching equipment and furniture as well as the maintenance costs on all of these. The capital sums upon which these calculations were based were taken from the insured value of the items concerned on the University's books. The insured-value was multiplied by the appropriate sinking fund factor at 7 per cent over a period of 50 years.²

We illustrate by taking the example of Mechanical Engineers. These undergraduates are trained in a

² Seven per cent was chosen since this was the approximate rate of return on government securities with no maturity date during the year of this study. Unfortunately, this rate doubtless included a premium for an expected decline in the purchasing power of the means of repayment and the 'real' cost of borrowing money was probably less. This 'real' cost would be the money interest rate minus the 'expected' percentage annual increase in the cost of living index. The return on investment should either be compared with this, real interest rate, or an estimate of increments in returns due to cost of living increases over the life of the investment should be included on the benefit side. But in this analysis we have simply followed convention and taken no account of either of these considerations.

Fifty years amortisation is the figure traditionally used in the United States by the National Committee on Standard Reports for Institutions of Higher Education (see: *Financial Reports for Colleges and Universities* (Chicago: Chicago University Press, 1935)). But the University of Bradford also rents buildings and equipment. In these cases, the annual rental charge was substituted for interest and amortisation.

single building, the so-called 'Main Building'. This has an insured capital value of £3,290,186. With an interest rate of 7 per cent and amortisation of 50 years, the sinking fund factor for annual repayments would be 0.072460. Thus, the annual capital value of the building was taken as £3,290,186 \times 0.072460 or £238,407. To this was added the value of the site upon which the building stood – £18,400 multiplied by 7/100 only, since such land never depreciates and need not be amortised. Then too, the building has been adapted from time to time at a total cost of £15,095 and the costs of these alterations had to be met in annual terms. They were, then, £1,094.

Maintenance expenditures³ at the rate of £182,793 per year were also added, summing to a grand total of £423,582. We then divided this by the 263,999 total square feet of 'assignable area'⁴ for all purposes in the Main Building. The result was a figure of £1 12s 1d for the annual capital and maintenance value per square foot of this 'assignable area'.

The method of distributing this cost per square foot to different undergraduate requirements was as follows:

(a) *Classroom space*; 41,486 square feet (16 per cent of the total assignable floor area) were used for classrooms. Of this, 13 per cent was so employed by mechanical engineers, or 5,393 square feet. At £1 12s 1d per square foot, the cost of classroom floor space for mechanical engineers was £8,653 per year. £8,653 \div 218 undergraduates⁵ in mechanical engineering equalled £40⁶ per student per year.

(b) *Teaching laboratories*; The square footage of teaching laboratories totalled 107,493 square feet (41 per cent of the total assignable floor space in the Main Building). Of this, mechanical engineering

occupied 28,603 square feet for undergraduate teaching purposes. But some of the mechanical engineering laboratories were used by undergraduates in electrical engineering, physics and textile technology. Thus, a part of the mechanical engineering laboratory expenditure was attributable to these undergraduates. Moreover, the mechanical engineers also used some of the laboratory space in electrical engineering and physics, modern languages and computer science. Therefore, a part of the use of these teaching laboratories was also attributable to mechanical engineers. The annual value of the total square footage of teaching laboratory expenditures thus allocated to mechanical engineers amounted to £46,166⁷. This sum was again divided by the relevant number of undergraduates (218) in order to get the cost of teaching laboratories for each mechanical engineer. The resulting figure was £212 per student per year, or more than five times the cost of classroom floor space per undergraduate.

(c) *Teaching staff – office space*; values per student were arrived at by taking the square footage used in this way and by attributing a proportion of it to undergraduate teaching. The proportion was taken as equalling the percentage of staff time spent on undergraduate teaching (see Part 1, Section 2 of this paper). Out of the total academic staff office space of 3,211 square feet in mechanical engineering, 1,830 square feet was thus attributed to undergraduate teaching. But a part of this was used in teaching undergraduates in disciplines other than mechanical engineering; i.e. textile and electrical engineering as well as physics. Likewise, a part of the academic staff office space in electrical engineering and physics, as well as other disciplines, was attributable to mechanical engineers.⁸ This amount was then divided by the number of undergraduates in mechanical engineering, i.e. £3,853 \div 218 or £18 per student per year.

(d) *Administrative office space*; General administrative office space (Vice-Chancellor's, Registrar's, and Bursar's offices) amounted to 8,588 square feet or £13,779. This expenditure was distributed equally among total students enrolled (at all levels) in the University. The resultant figure was £13,779 \div 2,778

³ Maintenance expenditures here comprise annual insurance premiums on the buildings, expenditure on materials (i.e. cleaning requisites), water charges, heating, wages and salaries of porters, cleaners and superintending staff, etc., as well as miscellaneous expenditures such as for window cleaning and the like.

⁴ The cost per square foot of the classroom, laboratory, student facility space and office space which is actually used in connection with teaching and research or for any other identifiable purpose, such as the Registrar's Office and Students' Union, is assignable space. But the personnel involved in these activities will also use corridors, lifts, toilets, etc. We have, therefore, chosen to add these costs to the actual cost per square foot of space used for identifiable purposes alone. Thus, the resulting figure of £1 12s 1d incorporates not only the cost per square foot of space actually used for identifiable purposes, but also a proportion of the corridor, lift and toilet-space and the like in the 'Main Building'. Hereafter all discussion of square footage means 'assignable area' so defined.

⁵ It was assumed that building floor space was used equally by all the undergraduates of a particular discipline regardless of the year of the course.

⁶ Hereafter all figures are rounded to the nearest pound sterling.

⁷ Three per cent of the total teaching time in mechanical engineering laboratories was given to other disciplines. This meant that the laboratory space attributable to mechanical engineers was 28,504 square feet \times 97/100, equalling 27,649 square feet or £44,354. But mechanical engineers used other disciplines' laboratories totalling 1,130 square feet or 4 per cent of total teaching time in electrical engineering, physics, modern languages and computer science. Thus, laboratory square footage attributable to mechanical engineers was 28,779 square feet. At £1 12s 1d per square foot, it was valued at £46,166.

⁸ This figure was derived from the appropriate teaching time-tables in the same way as for footnote 7. The cost per square foot of space in buildings other than the Main Building was used where appropriate.

TABLE 1

Total cost per student year by discipline for the session 1966-67

University of Bradford (in £ sterling)

(1) Classification of expenditure	(2) Mechanical engineering					(3) Chemical engineering					(4) Civil engineering			
	1 yr.	2 yr.	3 yr.	4 yr.	Total	1 yr.	2 yr.	3 yr.	4 yr.	Total	1 yr.	2 yr.	3 yr.	4 yr.
1 Capital and maintenance costs														
a. Classroom	40	40	40	40	160	34	34	34	34	136	58	58	x	58
b. Teaching laboratories	212	212	212	212	848	16	16	16	16	64	118	118	x	118
c. Academic staff office	18	18	18	18	72	8	8	8	8	32	13	13	x	13
d. Administrative staff office	7	7	7	7	28	8	8	8	8	32	7	7	7	7
e. Study facility space	13	13	13	13	52	13	13	13	13	52	13	13	13	13
f. Student facility space	97	97	97	97	388	97	97	97	97	388	97	97	97	97
<i>sub-total</i>	387	387	387	387	1548	176	176	176	176	704	306	306	117	306
2 Teaching costs														
a. Salaries of teaching staff	128	166	207	234	735	136	150	320	170	776	114	120	18	202
b. Technical staff salaries	30	42	59	81	212	25	31	66	38	160	26	26	x	52
c. Expenditure on teaching equipment and materials	61	77	113	161	412	30	34	79	39	182	48	49	x	92
d. Expenditure on industrial visits	1	1	1	—	3	4	4	4	4	16	x	x	3	x
<i>sub-total</i>	220	286	380	476	1362	195	219	469	251	1134	188	195	21	346
3 Administrative expenditure														
a. General	76	76	76	76	304	76	76	76	76	304	76	76	76	76
b. School	10	10	10	10	40	14	14	14	14	56	6	6	6	6
<i>sub-total</i>	86	86	86	86	344	90	90	90	90	360	82	82	82	82
4 Library expenditure	12	12	12	12	48	11	11	11	11	44	11	11	11	11
5 Student facilities, general, educational and miscellaneous expenditures	27	27	27	27	108	27	27	27	27	108	27	27	27	27
6 Student earnings foregone	462	581	624	964	2631	462	581	624	964	2631	462	581	624	964
a. Vacation and industrial training earnings	220	192	192	60	664	225	192	137	192	746	60	60	528	60
b. Net earnings foregone (6) — (6a)	242	389	432	904	1967	237	389	487	772	1885	402	521	96	904
<i>Total cost per student year</i>	974	1187	1324	1892	5377	738	912	1260	1327	4235	1016	1142	354	1676

Sources: See text of this paper.

(5) Electrical Engineering					(6) Physics					(7) Chemistry					(8) Colour Chemistry			
2 yr.	3 yr.	4 yr.	Total		1 yr.	2 yr.	3 yr.	4 yr.	Total	1 yr.	2 yr.	3 yr.	4 yr.	Total	1 yr.	2 yr.	3 yr.	Total
35	35	35	140		19	19	19	19	76	65	x	65	65	195	104	104	104	312
123	123	123	492		97	97	97	97	388	263	x	263	263	789	167	167	167	501
15	15	15	60		12	12	12	12	48	74	x	74	74	222	56	56	56	168
6	6	6	24		7	7	7	7	28	43	43	43	43	172	42	42	42	126
13	13	13	52		13	13	13	13	52	13	13	13	13	52	13	13	13	39
97	97	97	388		97	97	97	97	388	97	97	97	97	388	97	97	97	291
289	289	289	1166		245	245	245	245	980	555	153	555	555	1818	479	479	479	1437
179	251	257	797		135	103	307	349	894	122	31	225	207	585	277	357	549	1183
35	44	52	153		24	15	48	55	142	22	x	32	45	99	52	67	118	237
67	71	76	259		99	68	192	209	568	38	x	47	55	140	69	88	145	302
2	2	x	6		3	3	3	3	12	x	7	x	x	7	x	x	x	x
283	368	385	1215		261	189	550	616	1616	182	38	304	307	831	398	512	812	1722
76	76	76	304		76	76	76	76	304	76	76	76	76	304	76	76	76	228
12	12	12	48		12	12	12	12	48	19	19	19	19	76	19	19	19	57
88	88	88	352		88	88	88	88	352	95	95	95	95	380	95	95	95	285
11	11	11	44		22	22	22	22	88	22	22	22	22	88	22	22	22	66
27	27	27	108		27	27	27	27	108	27	27	27	27	108	27	27	27	81
581	624	964	2631		462	581	624	964	2631	462	581	624	964	2631	462	581	624	1667
192	192	60	669		170	170	170	60	570	60	528	60	60	708	60	60	60	180
389	432	904	1962		292	411	454	904	2061	402	53	564	904	1923	402	521	564	1487
087	1215	1704	4837		935	982	1386	1902	5205	1283	388	1567	1910	5148	1423	1656	1999	5078

(12) Statistics					(13) Biological Science					(14) Pharmacy				(15) Economics			
2 yr.	3 yr.	4 yr.	Total		1 yr.	2 yr.	3 yr.	4 yr.	Total	1 yr.	2 yr.	3 yr.	Total	1 yr.	2 yr.	3 yr.	Total
48	x	48	144		30	30	x	30	90	18	18	18	54	107	107	107	321
32	x	32	96		124	124	x	124	372	200	200	200	600	—	—	—	—
8	x	8	24		30	30	x	30	90	19	19	19	57	26	26	26	78
7	7	7	28		9	9	9	9	36	10	10	10	30	10	10	10	30
13	13	13	52		13	13	13	13	52	13	13	13	39	13	13	13	39
97	97	97	388		97	97	97	97	388	97	97	97	291	97	97	97	291
205	117	205	732		303	303	119	303	1028	357	357	357	1071	253	253	253	759
193	13	300	727		220	260	30	568	1078	159	212	432	803	84	186	175	445
3	x	9	22		47	56	—	154	257	40	49	120	209	4	x	x	4
3	x	5	12		92	92	—	251	435	43	50	120	213	43	x	x	43
x	15	x	15		x	x	11	x	11	x	x	x	x	x	x	x	x
199	28	314	776		359	408	41	973	1781	242	311	672	1225	131	186	175	492
76	76	76	304		76	76	76	76	304	76	76	76	228	76	76	76	228
9	9	9	36		16	16	16	16	64	11	11	11	33	12	12	12	36
85	85	85	340		92	92	92	92	368	87	87	87	261	88	88	88	264
22	22	22	88		27	27	27	27	108	27	27	27	81	65	65	65	195
27	27	27	108		27	27	27	27	108	27	27	27	81	27	27	27	81
581	624	964	2631		462	581	624	964	2631	462	581	624	1667	462	581	624	1667
60	528	60	708		60	60	528	60	708	60	60	60	180	60	60	60	180
521	96	904	1923		402	521	96	904	1923	402	521	564	1487	402	521	564	1487
1059	375	1557	3967		1210	1378	402	2328	5316	1142	1330	1734	4206	966	1140	1172	3278

Table 1 (continued)

(1) Classification of expenditure	(16) Management, Administration				(17) Modern Languages				
	1 yr.	2 yr.	3 yr.	Total	1 yr.	2 yr.	3 yr.	4 yr.	Total
1 Capital and maintenance costs									
a. Classroom	17	17	17	51	94	94	x	94	282
b. Teaching laboratories	3	3	3	9	30	30	x	30	90
c. Academic staff office	13	13	13	39	27	27	x	27	81
d. Administrative staff office	10	10	10	30	12	12	12	12	48
e. Study facility space	13	13	13	39	13	13	13	13	52
f. Student facility space	97	97	97	291	97	97	97	97	388
<i>sub-total</i>	153	153	153	459	273	273	122	273	941
2 Teaching costs									
a. Salaries of teaching staff	98	152	258	508	137	142	36	411	726
b. Technical staff salaries	1	1	3	5	4	5	—	8	17
c. Expenditure on teaching equipment and materials	17	17	44	78	46	15	—	92	153
d. Expenditure on industrial visits	x	x	x	x	x	x	12	x	12
<i>sub-total</i>	116	170	305	591	187	162	48	511	908
3 Administrative expenditure									
a. General	76	76	76	228	76	76	76	76	304
b. School	12	12	12	36	12	12	12	12	48
<i>sub-total</i>	88	88	88	264	88	88	88	88	352
4 Library expenditure	65	65	65	195	65	65	65	65	260
5 Student facilities, general, educational and miscellaneous expenditures	27	27	27	81	27	27	27	27	108
6 Student earnings foregone	462	581	624	1667	462	581	624	964	2631
a. Vacation and industrial training earnings	60	60	60	180	60	60	528	60	708
b. Net earnings foregone (6)–(6a)	402	521	564	1487	402	521	96	904	1923
<i>Total cost per student year</i>	851	1024	1202	3077	1042	1136	446	1868	4492

Sources: See text of this paper.

students or £5 per student per year.

Individual school secretarial office space (amounting to 285 square feet; i.e. 10 per cent of the total school secretarial office space) valued at £445 was allocated to undergraduates in the School of Mechanical Engineering. This amount, £445, was then divided by 218 undergraduates equalling £2 per student year. Thus the total under heading (d) was £7 per student in each year of his course.

(e) *Study facility space*; like libraries, general reading rooms and advanced reading rooms, amounted to 23,883 square feet from all University buildings. The average space expenditure per square foot for the University as a whole (as opposed to the Main Building alone) was £1 14s od. Thus, the total expenditure attributable to study facility space amounted to £40,601. This amount was divided by 3,131, the number of undergraduate equivalent students.⁹ A resultant figure of £13 (i.e. £40,493 ÷ 3,131) per student year was obtained.

(f) *Student facility space*; This included the following items:

- (i) The deficit on University-owned halls of residence and student houses
- (ii) Refectories, students' union office,¹⁰ gymnasiums, lodgings office, etc.
- (iii) Playing fields
- (iv) Miscellaneous expenditures.

The annual capital and maintenance expenditure for each of the above items was arrived at in the following way:

(i) Halls of residence and student houses had an insured capital value of £902,540. With an interest rate of 7 per cent and amortisation of fifty years, the sinking fund factor for annual repayments would be 0.072460. Thus the annual capital value of the halls of residence and student houses was £902,540 × 0.072460 or £65,398. The insured capital value of equipment housed in these residences was £117,607. With an interest rate of 7 per cent and amortisation of 15 years,¹¹ the sinking fund factor would be 0.109795. The annual capital value of such equipment was £117,607 × 0.109795 or £12,913. Thus, the annual capital value of University residences and equipment in these residences amounted to £78,311. To this was added the value of the sites of the halls of residence and student houses of £316,320, multiplied by 7/100

⁹ It was assumed that postgraduates use reading facilities twice as much as do undergraduates. Thus, undergraduate equivalency was arrived on the basis of one postgraduate equalling two undergraduates.

¹⁰ Other costs for the students' union are covered out of union dues and are regarded as a consumption item which is covered by earnings foregone.

¹¹ A fifteen years amortisation figure was used by the National Committee on Higher Education, *loc. cit.*

only, since, as has been said, such land never depreciates and need not be amortised. Therefore, the interest calculated on value of the site was £316,320 × 7/100 or £22,142. To this was added the annual cost of adaptations of £13,468 (i.e. £976). Annual maintenance expenditures of £36,934¹² were also included. Thus the annual capital value and maintenance expenditures on halls of residence and student houses summed to a total of £138,363.

Student residence fees made no contribution whatever towards these costs. Indeed, they did not even cover the recurrent charges on operating the halls of residence and student houses. We have therefore decided to attribute to the cost of education the entire annual capital and maintenance charges on halls of residence and houses (£138,363) together with the small deficit (£4,202) on recurrent charges such as food provision, wages, etc. This totalled to a sum of £142,565.

The rationale underlying this treatment of the deficit on the operation of halls and houses is based upon an assumption that society must provide subsistence for its members whether they are undergoing education or not. But these residences are often new and rather more lavish than society's feelings of obligation might require. It is often argued in support of their construction, that putting students together in halls of residence has an educational value. Therefore, if we assumed that the student pays a hall-fee competitive with lodgings in the town, then the deficit on these halls and student houses may be thought of as equalling society's view of their educational value.

(ii) The annual capital and maintenance expenditure on student facility space, such as refectories, Students' Union office, gymnasiums, etc., amounted to £98,542 for 58,970 square feet of space for student facilities. None of these expenditures were charged to students in terms of fees, meal costs, etc. They are therefore included in the investment in their education, since otherwise student refectory charges, for example, might not be competitive with facilities outside which can use their plant more fully through the year.

(iii) The annual capital value of playing fields (i.e. equipment and cost of the site) was obtained in the following way. The total insured capital value of the equipment in playing fields equalled £33,031. At 7 per cent interest and 15 years of amortisation, the annual capital value calculated was £3,627. To this was added annual interest at 7 per cent on cost of the site of playing fields (£40,805) equalling £2,856. Thus, the total annual capital value of playing fields

¹² I.e. repairs to buildings, maintenance of grounds, etc.

amounted to £6,483. We have chosen to treat this University contribution to the construction and maintenance of playing fields, as well as other sports expenditures given later, as part of the investment in education. But this is purely arbitrary and may be a little too Victorian for some tastes.

(iv) Miscellaneous expenditure¹³ of £22,378 annually was also added to space facility expenditure. Thus, the annual capital and maintenance expenditure for the space used for student facilities was the sum of (i), (ii), (iii) and (iv) or £142,565, £98,542, £6,483 and £22,378 or £269,968 in total. This amount was divided by the total number of 2,778 students enrolled (at all levels) in 1966-67 to get a figure of £97 *per student per year*.

In Summary, then yearly capital and maintenance costs per undergraduate mechanical engineer were: £40 for classroom space, £212 for teaching laboratory space, £25 for academic staff, general administrative and school secretarial office space, £13 for study facility space and £97 for student facility space or £387 *in total per student year*.

2. Instruction expenses

These comprised annual salaries and expense allowances of: (a) teaching and (b) technical staff, as well as (c) the annual value of capital equipment and materials used in teaching. Salaries were calculated on the basis of the percentage of staff time devoted to undergraduate activities. We again illustrate this procedure by reference to undergraduate mechanical engineering.

(a) *Annual salaries and fringe benefits of teaching staff*; A diary was sent out to 200 out of a total of 335 academic staff during the week beginning 18 March 1968. Half of these receiving the diary were asked to fill in the hours spent on teaching or otherwise dealing with undergraduates, including relevant administration. The remainder were requested to record hours spent dealing with postgraduate matters, research and other activities. Staff were so divided in order that they should not feel that the *total* number of hours which they worked was under examination. It could be assumed that time not spent on undergraduate activities was spent on postgraduate work and personal research and vice versa. Nevertheless, a direct figure was obtained for the proportion of staff time devoted to teaching and administering undergraduates. The response rate was 80 per cent.

The resultant average teaching staff time spent on undergraduates in engineering was 57 per cent, physical sciences 45 per cent, life sciences 55 per cent and social sciences 61 per cent during term-time.

However, academic staff in mechanical engineering did not spend all this 57 per cent of their time teaching undergraduates in their own discipline. They also taught physicists as well as textile, civil and chemical engineers. But on average they did spend more than four-fifths of their time training their own undergraduates. Therefore, the salaries of the teaching staff in mechanical engineering attributable to the training of their undergraduates during the term time was taken as their total salaries and fringe benefits \times the average teaching year of 33 weeks (at Bradford University) over a 46 working year \times the proportion of that time spent on teaching their own undergraduates.

The same exercise had also to be repeated for time spent on undergraduate activities during vacations in admissions, lecture preparations, etc. According to the Robbins Report,¹⁴ British university staff members spent 20 per cent of the vacation time (taking the three vacations as a whole, but excluding a six week holiday) on undergraduate activities. The figure of 20 per cent was calculated as follows: 8 per cent of the vacation time was spent on teaching, preparation and correction, out of which $\frac{2}{3}$ was spent on undergraduates or $8 \times \frac{2}{3}$ or 5 per cent. To this was added a figure of 15 per cent for undergraduate administration and of related work. Thus, 20 per cent of non-holiday vacation time of 13 weeks (i.e. 46-33), or the equivalent of, say, three full weeks were deemed to be spent on undergraduate activities.

The salaries of teaching staff for three full weeks over a 46 week working year were, then, added to those attributable to undergraduate teaching in mechanical engineering during term-time. Thus, the salaries of the teaching staff in mechanical engineering attributable to the training of undergraduates in their own discipline during term-time and vacations were taken as their total salaries $\times 33/46 \times$ the proportion of their time spent on teaching undergraduates during term-time or $(£57,489 \times 33/46 \times 57/100)$ or £23,508 plus full salaries for three weeks during vacation time or $£57,489 \times 3/46$ or £3,749.

The £23,508 + £3,749 or £27,257 was then multiplied by the proportion of time spent by teachers of mechanical engineering on their own undergraduates, i.e. $£27,257 \times 83/100 = £22,623$. This gave the value of teaching given to undergraduate mechanical engineers by their own staff in all four years. It is possible to divide this between these years if we take, for example, the 17 per cent (of the foregoing 83 per cent) of mechanical engineering staff teaching time spent on first year undergraduates alone $(£22,623 \times 17/100)$, £3,846. This exercise was repeated for each

¹³ Miscellaneous expenditures - expenditure on transport for University football teams and so on.

¹⁴ Committee on Higher Education, *Higher Education*, Appx. III (London: HMSO, 1963) pp. 60-1.

of the four years of the course and the results, together with the cost of teaching from other disciplines as covered in the next paragraph were entered into Table I.

In the same way as staff in mechanical engineering teach textile engineers, so teaching staff in mathematics, physics, electrical engineering, general studies, chemistry, management and computer science teach undergraduates in mechanical engineering. Their contribution to the cost of training undergraduate mechanical engineers was arrived at the same way as above and totalled £5,371 for the first year, a much larger figure than for ensuing years. Thus, the total teaching costs during term-time and vacation time for undergraduates in mechanical engineering was £3,846 + £5,371 = £9,217, thus making a total of £128, £116, £207 and £234 per first, second, third and fourth year student per year respectively.

(b) *Annual salaries of technical staff*; The corresponding proportion of total term-time technical staff salaries was added to the totals given in (a) above on the assumption that they also spent their time on undergraduates in the same proportion as did academic staff in teaching mechanical engineers. The value of this time equalled £10,664 in the case of technical staff in mechanical engineers. Part of this was allocated to disciplines other than mechanical engineering, also on the same basis as in (a) above. Then, too technicians in other disciplines likewise contributed to the training of mechanical engineers. In this way charges of £30, £42, £59 and £81 per first, second, third and fourth year student in mechanical engineering were obtained. The vacation salaries of technical staff were attributed *entirely* to non-undergraduate activities.

(c) *Teaching equipment and materials*; In the absence of an accumulated value of teaching equipment, their insured value was again taken.¹⁵ At 7 per cent interest rate and 15 years amortisation,¹⁶ the annual capital value of *teaching equipment* in mechanical engineering amounted to £47,154. Out of this, £14,443 or 31 per cent was allocated for undergraduate teaching.¹⁷ To this was added the 1966-67 expenditure of £6,470 on *teaching materials*. The total figure equalled

£20,913. This amount was again attributed to disciplines other than mechanical engineering on the same basis as shown in (a) of this Section, as were teaching materials 'received' from other disciplines. Thus the total teaching equipment and material expenditure amounted to £20,777, or £61 per first year undergraduate mechanical engineer. The figures for the second, third and fourth years of the course were - £77, £113 and £161 respectively.

(d) *Expenditure on industrial visits*; These included travelling and subsistence expenses incurred by the academic staff during the course of visiting sandwich course students undergoing industrial training. The expenditure for this purpose amounted to a total of £188 for 178 students in the first three years in mechanical engineering, or £1 per undergraduate mechanical engineer in each of the first three years. There is no industrial training during the fourth year.

Total annual instruction expenditure per student year for each of the four years of the course therefore amounted to £128 as teaching salaries + £30 technical staff salaries + £61 teaching equipment and material expenses + £1 expenditure incurred during industrial visits. Thus, an annual instruction cost of £220, £286, £380, £476, for each year of the course was derived. Individual student instruction cost by year of the course were derived in the same way for other disciplines. They are given below in Table I, row 2.

3. Administrative expenditures

These comprise the salaries of all administrative staff from the Vice-Chancellor down to clerical staff in the Schools of Studies. For convenience, we have divided them into: (a) General administrative staff - Registrar's and Bursar's offices (excluding porters, cleaners, etc., who are dealt with under I(1) above), and (b) School administrative staff salaries (i.e. professors' secretaries and School typists). Expenditures on appropriate office equipment are also divided under the above headings (a) and (b). We deal with each in turn.

(a) *General administrative expenditures*; These totalled up to £209,793. This sum was distributed equally among the number of students enrolled (2,778) in the University to arrive at a figure of £76 per student year.

(b) *School administrative expenditures*; Fortunately, these expenditures can be attributed directly to a particular discipline. In the case of the School of Mechanical Engineering, they equalled £2,327. One graduate student was weighed as equal to two undergraduates.

The cost per undergraduate student year, was,

¹⁵ On the advice of the University Finance Office, 30 per cent was added to the total insured value of teaching equipment housed in each of the University's buildings to take account of the value of non-insured equipment.

¹⁶ National Committee on Higher Education, *loc. cit.*

¹⁷ The percentage allocation expenditure on teaching equipment for undergraduates in mechanical engineering was taken as being equal to the percentage purchase value of undergraduate teaching equipment for mechanical engineers for the year 1966-67. A separate account was kept during that year for teaching equipment purchased for undergraduate teaching purposes alone. (Source: University of Bradford, Form 3 - Finance Tables 3A, 3B).

therefore, $\pounds 2,327 \div 224^{18}$ undergraduate student equivalents, or $\pounds 10$ per student year.

4. Library expenditures

In the absence of a figure for the insured value of library books, we were compelled to take the total purchases for the year 1966-67 as representing the annual value of the stock of books. This amounted to $\pounds 75,156$ in total (including expenditure on book-bindings, etc.). The University allocated this total for expenditures among different disciplines through a system of points which was thought to correspond to library use by students and staff. Ten undergraduates in the Board of Engineering were given one point, five postgraduates by course were given one point, two postgraduates (by research) or two research assistants one point, and each academic staff member one point. The points system was varied somewhat throughout the University; i.e. Social Sciences were awarded four points for 10 undergraduates. The result was a total pointage of 1,515 for all members of the University in 1966-67. We divided this figure into the total expenditure on books for that year of $\pounds 75,156$ mentioned above, plus library staff salaries of $\pounds 39,141$. This gave a figure of $\pounds 75$ per point (i.e. $\pounds 114,297 \div 1,515$). The total number of points given to the training of mechanical engineering undergraduates was derived from the attribution of points given above (i.e. 10 undergraduates were given one point and each member of teaching staff in mechanical engineering was also given one point). But the 25 points for 25 staff members in mechanical engineering had to be adjusted to take account of the fact that not all of the books purchased on their behalf were attributable to training undergraduates. It was, therefore, assumed that the 57/100 of their term time spent on teaching undergraduates corresponded to the proportion of the value of their books attributable to undergraduates. The complications raised by teaching from and in other disciplines were set aside here in favour of a simpler solution of taking points attributable to staff and students in mechanical engineering alone. Therefore, $21.8 + (25 \times 57/100)$ or 36 points at $\pounds 75$ a point gives a figure of $\pounds 2,700$. Thus, with 218 undergraduates in mechanical engineering, library expenditure amounted to $\pounds 12$ per student year.

5. Students facilities, general educational and miscellaneous expenditures

The first of these comprised the deficit on refectories in addition to the cost of the space they occupy, as

¹⁸ I.e. 218 undergraduates + six (or three graduates) full-time equivalent undergraduate students in Mechanical Engineering.

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well as the University's other contribution to Students' Union, to sports, to medical facilities and so on. These items totalled $\pounds 29,620$ and were distributed equally among the students enrolled. They gave a figure of $\pounds 29,620 \div 2,778$ or $\pounds 11$ per student year.

General educational expenditure included such items as external examiners' fees, printing and stationery for examinations, contributions such as to the University Central Council on Admissions (UCCA) and to the Committee of Vice-Chancellors, etc. They also included allowances made to academic staff for other than industrial visits. The amount for this kind of expenditure totalled $\pounds 34,149$. To this was added miscellaneous expenditure of $\pounds 9,580$, such as expenditures on hospitality, staff removal allowances, etc. The total expenditure for general education and miscellaneous expenditures therefore amounted to $\pounds 43,729$. This was then divided by the number of students enrolled, 2,778, in order to get the per student year figure of $\pounds 43,729 \div$ or $\pounds 16$.

Thus, total expenditure for student facilities, general educational facilities and miscellaneous activities amounted to $\pounds 27$ per student per year.

6. Net earnings foregone

Net earnings foregone are total losses to society incurred as a result of work-time lost through education. They are part of the Society's investment in 'producing' graduates. We took account of this in the following way.

Seventeen per cent¹⁹ was added to Blaug, Peston and Zeiderman's figures for earnings of school-leavers with 'A' level (i.e. approximating to university entrance) qualifications in 1964-65.²⁰ The results (as earnings foregone) were as follows:

$\pounds 462$ per year at the age of 18

$\pounds 581$ per year at the age of 19

$\pounds 624$ per year at the age of 20

$\pounds 964$ per year at the age of 21

From these figures, we subtracted part-time, vacation and industrial training earnings of university students. We chose to accept the 1962 figure in the *Robbins Report*²¹ for vacation earnings of $\pounds 50$ per student, plus 20 per cent,²² or up to $\pounds 60$, representing increases in average wages between 1962 and 1967. We also subtracted earnings during the industrial training involved in the sandwich course.²³ A sum of

¹⁹ The average increase in salaries from 1964-65 to 1967 (the year of our analysis) (source, UK Ministry of Labour, *Employment and Productivity Gazette*, Vol. 77, No. 2 London: HMSO February 1969), p. 38.

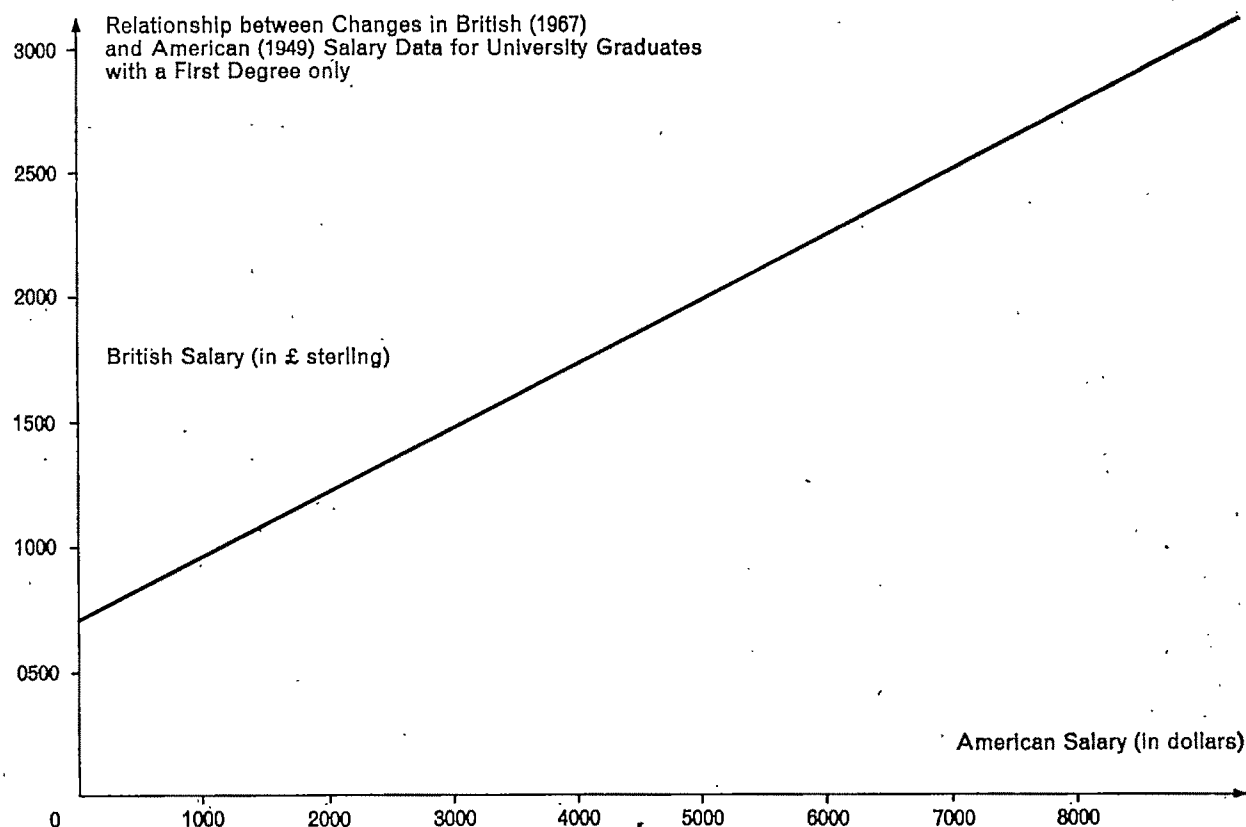
²⁰ M. Blaug, M. Peston: and A. Zeiderman, *The Utilization of Educated Manpower in Industry* (Edinburgh and London: Oliver and Boyd, 1967), p. 34.

²¹ Committee on Higher Education. *Robbins Report*.

²² UK Ministry of Labour, *loc. cit.*

²³ See footnote 1 above.

FIGURE 1



Source: *Cornmarket Salary Survey 1967* (London: Salary Survey Unit of the Cornmarket Press, October 1967) and H. S. Houthakaar "Education and Income", *Review of Economics and Statistics*, vol. 41, No. 1 (February 1959), p.25

£11²⁴ per week was taken for 1966-67. The periods of industrial training for mechanical engineers equalled 14½ weeks in the first year, or £160, 12 weeks in the second and third year, or £132 each, in addition to normal vacation earnings. The net earnings foregone in each year by undergraduate mechanical engineers thus comprised total earnings foregone minus vacation and industrial training earnings, or £242 for the first year, £389 for the second year, £432 for the third year and £904 for the fourth year.

II. Returns

We divide returns into social and private.

(a) *Social returns* to a graduate in mechanical engineering were obtained in the following way. We first took Blaug, Peston and Zeiderman's mean salary figures for each year from 22 to 65 (plus 17 per

cent²⁵) for school-leavers with 'A' level qualifications (again taken as equivalent to University entrance) who did not go to University. We then subtracted these from the Cornmarket figures for medium earnings, during the year ending October 1967, of graduate mechanical engineers from 22 years of age onwards.²⁶ But the Cornmarket figures ceased at 45. We therefore chose to extrapolate British earnings from 45 to 65 on the basis of American data for graduate earnings for the year 1949.²⁷ These data showed a close straight-line correlation (0.97) between changes in American graduate earnings from year to year between 22 and 45 with those of their British counterparts during 1967. This straight line was thus extended to the peak of American earnings reached after 45, and the corresponding hypothetical British earnings were read of this straight-line extrapolation as given in Figure I. After the point at which peak American earnings were reached the

²⁴ A survey of earnings of the students in engineering during their industrial training period was undertaken by the University of Bradford Students' Union for 1967-68 and a figure of £11 as earnings per week after tax was revealed (source: University of Bradford Union, *Submission to the University Grants Committee*, June 1969). We have arbitrarily equalled 1966-67 earnings before tax with 1967-68 earnings after tax.

²⁵ See footnote 19 above.

²⁶ *Cornmarket Salary Survey: 1967* (London: Salary Survey Unit of Cornmarket Press, October 1967), *pass*.

²⁷ See H. S. Houthakaar, 'Education and Income', *Review of Economics and Statistics*, Vol. 41, No. 1 (February 1959), p. 25.

TABLE II
Total costs per student per year by discipline
University of Bradford, 1966-67 (in £ sterling)

Discipline	Year of the course				Total cost
	1	2	3	4	
Mechanical engineering	974	1,187	1,324	1,892	5,377
Chemical engineering	736	912	1,260	1,327	4,235
Civil engineering	1,016	1,142	354	1,676	4,188
Electrical engineering	831	1,087	1,215	1,704	4,837
Physics	936	982	1,386	1,902	5,205
Chemistry	1,283	388	1,567	1,910	5,148
Colour chemistry	1,423	1,656	1,999	.	5,078
Ophthalmic optics	1,548	1,515	1,470	.	4,533
Textiles technology	1,078	1,121	367	1,797	4,363
Mathematics	989	1,063	972	1,697	4,721
Statistics	976	1,059	375	1,557	3,967
Biological science	1,210	1,378	402	2,326	5,316
Pharmacy	1,142	1,330	1,734	.	4,206
Economics	966	1,140	1,172	.	3,278
Management administration	851	1,024	1,202	.	3,077
Modern languages	1,042	1,136	446	1,868	4,492

Note: For details, see Table I

* The course is a three-year one

corresponding supposed decline in British earnings towards the end of a graduate's working life was estimated by retreating down this straight line and reading off the British equivalent of the declining American incomes. This was done on the basis of a supposition that graduate employment conditions in Britain in 1967 were similar to those obtaining in the United States some 18 years previously. But whether this was so or not, data limitations forced us to use these changes in average graduate earnings (i.e. regardless of discipline) in the United States after 45 as a basis for estimating changes in British graduate earnings in particular disciplines during the same period of working life. The consequences of statistical dubiety of this approach, together with omission of an allowance for mortality rates, are mitigated by the fact that errors after 20-odd years are of greatly diminished importance in discounted cash flow calculations. The results of this analysis, which are based upon the appropriate readings from 'the fitted curve' in Figure 1, are entered in Table III.

(b) *Private returns* were calculated first on the assumption that a student received no grant, and second that he received the full grant.

A student receiving no grant from his local authority would find that private cost from his and his family's point of view equalled his net earnings foregone for the duration of the course after tax less an appropriate tax relief to the parent presumed to be financing his education. His returns would be based upon those listed in Table III net of income tax. In this respect we chose to assume that the earnings attributable to the training in question were taxed at the standard

rate after deduction of two-ninths earned income allowance.

A student receiving the full grant would find that private costs equalled his net earnings foregone after tax, less an appropriate tax exemption for his parent, minus the maintenance (i.e. not including the fee) allowance from his local authority.

Conclusions

The social cost and returns for the disciplines covered in the study are set out for the years 18 to 65 in Tables II and III respectively. The social internal rate of return and benefit/cost ratios, the latter at 7 per cent, were calculated by computer and are also entered in Table IV. Not all internal rates of return were above the then cost to the British Government of borrowing money at 7 per cent and not all the training covered may have been justified.²⁸ Further, some training (i.e. Statistics) is more easily justified than others (i.e. Mechanical Engineering) in purely present value terms.

We also calculated the private rates of return to students with and without local authority support, except for fees.²⁹ These too are entered in Table IV. The proximity of private rates without a maintenance grant to social rates is explained in the use of earnings *net* of tax for the former calculations.

²⁸ But less easily justified at the current rate of interest on Consols of between 9 and 10 per cent - but the reader is referred again to footnote 2 in this respect.

²⁹ Local authorities generally pay a sum which corresponds closely to fee charges to all British students whether or not they are in receipt of a maintenance grant.

TABLE III
Annual median earnings of graduates by disciplines and by age in October 1967 (in £ sterling)

Year	Annual earnings with 'A' levels only	Mechanical engineering	Chemical engineering	Civil engineering	Electrical engineering	Physics	Chemistry	Mathematics	Statistics	Economics
1	2	3	4	5	6	7	8	9	10	11
18	482	220	225	60	225	170	60	60	60	60
19	581	192	192	60	192	170	528	192	60	60
20	624	192	137	528	192	170	60	231	528	60
21	964	60	192	60	60	60	60	60	60	992
22	827	1,016	1,046	1,046	1,015	1,030	987	1,022	1,037	1,011
23	1,048	1,068	1,128	1,128	1,065	1,095	1,011	1,081	1,111	1,058
24	1,137	1,120	1,210	1,210	1,115	1,160	1,035	1,140	1,185	1,105
25	1,146	1,207	1,283	1,317	1,195	1,233	1,127	1,253	1,287	1,225
26	1,155	1,293	1,357	1,423	1,275	1,307	1,218	1,367	1,383	1,345
27	1,164	1,379	1,431	1,529	1,355	1,381	1,309	1,481	1,489	1,465
28	1,174	1,465	1,605	1,635	1,435	1,455	1,400	1,595	1,590	1,585
29	1,183	1,509	1,618	1,716	1,489	1,584	1,481	1,692	1,749	1,676
30	1,234	1,553	1,731	1,797	1,543	1,713	1,562	1,789	1,908	1,767
31	1,286	1,597	1,844	1,878	1,597	1,842	1,643	1,886	2,067	1,858
32	1,337	1,641	1,957	1,959	1,651	1,971	1,724	1,983	2,226	1,949
33	1,389	1,685	2,070	2,040	1,705	2,100	1,805	2,080	2,385	2,040
34	1,441	1,738	2,152	2,093	1,767	2,150	1,873	2,128	2,417	2,100
35	1,467	1,791	2,234	2,146	1,829	2,200	1,941	2,176	2,449	2,160
36	1,493	1,844	2,316	2,199	1,891	2,250	2,009	2,224	2,481	2,220
37	1,519	1,897	2,398	2,252	1,953	2,300	2,077	2,272	2,513	2,280
38	1,544	1,950	2,480	2,305	2,015	2,350	2,146	2,320	2,545	2,340
39	1,571	2,019	2,534	2,363	2,087	2,370	2,226	2,346	2,671	2,450
40	1,604	2,088	2,588	2,421	2,159	2,390	2,307	2,372	2,797	2,560
41	1,637	2,157	2,642	2,479	2,231	2,410	2,388	2,398	2,923	2,670
42	1,670	2,226	2,696	2,537	2,303	2,430	2,469	2,424	3,049	2,780
43	1,702	2,295	2,750	2,595	2,375	2,450	2,550	2,450	3,175	2,890
44	1,735	2,330	2,791	2,640	2,411	2,486	2,588	2,487	3,223	2,933
45*	1,763	2,360	2,827	2,675	2,442	2,518	2,621	2,509	3,264	2,971
46	1,791	2,381	2,852	2,701	2,464	2,540	2,644	2,531	3,293	2,996
47	1,819	2,407	2,879	2,731	2,491	2,568	2,673	2,559	3,329	3,028
48	1,847	2,426	2,902	2,753	2,510	2,588	2,694	2,595	3,406	3,054
49	1,876	2,453	2,931	2,784	2,537	2,616	2,724	2,615	3,443	3,087
50	1,876	2,487	2,972	2,814	2,572	2,653	2,762	2,642	3,491	3,130
51	1,876	2,470	2,952	2,794	2,554	2,635	2,743	2,624	3,467	3,109
52	1,876	2,448	2,926	2,765	2,531	2,612	2,719	2,601	3,436	3,082
53	1,876	2,443	2,921	2,760	2,526	2,607	2,714	2,596	3,429	3,076
54	1,877	2,426	2,901	2,740	2,514	2,594	2,696	2,578	3,405	3,055
55	1,918	2,421	2,895	2,735	2,504	2,589	2,691	2,673	3,398	3,049
56	1,961	2,409	2,881	2,720	2,494	2,577	2,678	2,560	3,381	3,024
57	2,003	2,400	2,870	2,710	2,485	2,565	2,668	2,550	3,368	3,024
58	2,045	2,382	2,849	2,689	2,465	2,545	2,647	2,530	3,342	3,000
59	2,087	2,364	2,828	2,668	2,455	2,525	2,626	2,510	3,316	2,976
60	1,989	2,355	2,818	2,658	2,445	2,515	2,616	2,490	3,303	2,965
61	1,891	2,267	2,713	2,558	2,364	2,422	2,518	2,480	3,179	2,854
62	1,791	2,176	2,604	2,458	2,260	2,325	2,418	2,437	3,054	2,740
63	1,693	2,089	2,500	2,360	2,170	2,232	2,321	2,342	2,932	2,630
64	1,595	1,996	2,388	2,254	2,072	2,128	2,217	2,248	2,800	2,501
65	1,496	1,913	2,203	2,155	1,980	2,034	2,120	2,139	2,677	2,401
Total	73,039	88,605	105,119	100,898	90,955	96,615	96,093	97,218	119,086	108,391

life-time savings

*Note: Graduate salaries beyond 45 were based upon an extrapolation of the ratio of change between British and American data (see Fig. 1). The original data was largely in five-yearly intervals. This data has been smoothed to provide the above annual figures.

TABLE IV

<i>Discipline</i>	<i>Social internal rate of return</i>	<i>Social benefit/ cost ratio at 7 per cent</i>	<i>Private internal rate of return (with full grant)</i>	<i>Private internal rate of return (with no grant)</i>
Statistics	11.0	1.24	29.0	15.0
Economics	10.0	1.17	32.5	14.0
Chemical engineering	9.6	1.13	25.0	14.0
Civil engineering	9.7	1.11	29.0	13.5
Mathematics	7.5	1.02	23.5	12.0
Physics	7.5	1.02	24.0	12.0
Chemistry	6.5	0.97	22.5	10.0
Electrical engineering	6.0	0.96	19.5	9.5
Mechanical engineering	5.0	0.93	19.5	9.5

Note: Private rates of return are calculated to the nearest one-half per cent.

Benefit/cost ratio rankings change with the rate of interest used:

At 4 per cent Chemistry and Physics change places in the above ranking order;

At 10 per cent Physics and Mathematics change places;

At 15 per cent Electrical and Chemical Engineering change places;

At 20 per cent Electrical engineering ranks above Mathematics and Chemistry.

Closing the Ledger

B. S. Yamey

In the modern British balance sheet, as is well known, the assets are placed on the right-hand side and the liabilities and capital balances on the left-hand side of the statement. This practice is explained in the *Encyclopaedia of Accounting* (1903) as having 'arisen through the influence of the forms given in Acts of Parliament, chiefly the Companies Act, 1862, which must have been prepared by those unacquainted with the theory of accounts'.¹ In a recent article Professor Takatera has questioned this explanation by showing, *inter alia*, that several earlier balance sheets or other accounting statements of assets and liabilities listed assets on their 'credit' side and liabilities on their 'debit' side.² To that extent the model balance sheets given in early companies legislation may have been a reflection of an existing practice, and not an arbitrary imposition upon subsequent practice.

It is presumably impossible to establish why, precisely, the draftsmen of early companies legislation chose the arrangement they did for the model balance sheets. The main purpose of these notes is to suggest why their chosen arrangement might not have looked surprising, odd, incorrect or improper to many of their contemporaries in the business and accountancy worlds. I do not propose to argue that they would have accepted the arrangement as being logical in some sense, or as being the necessary product of some 'theory of accounts'. Rather, I will draw attention to two different ways in which the early exposition and practice of double entry bookkeeping may have accustomed accountants and businessmen to the notion that assets could be listed, naturally and with propriety, on the right-hand (credit) side of an account or statement, and liabilities and capital on the left-hand (debit) side. The notes conclude with a consideration, and rejection, of the idea that Simon Stevin, the celebrated Dutch mathematician, scientist and man of affairs, whose writings were published early in the seventeenth century, may have influenced British practice in the nineteenth century through his

exposition of merchants' accounts.

I

In opening a new ledger to follow on its closed predecessor it was necessary to carry forward certain account balances from the old to the new. There were several different procedures for achieving this transfer in an orderly fashion. One method was to have appropriate opening journal entries taking up the asset, liability and capital balances from the accounts in the old ledger, and posting them to the accounts in the new ledger. A tidier method was to collect the various account balances in a balance account established in the old ledger at its final closure, and to raise the opening journal entries from this balance account. Yet another method was to repeat the old ledger's closing balance account as the opening ledger account in the new ledger for the same purpose. This method is described in several early texts on bookkeeping. Its disadvantage, for a meticulous bookkeeper, was that the opening balance account could not be integrated with the remainder of the accounts in the new ledger: a debit entry in the balance account had no credit counterpoise in any other account, but was reflected in a second debit entry in some other account; and the rule that for each debit entry there should be a credit entry was broken. The 'accountantly' solution was to reproduce the closing balance account in the old ledger as the opening balance account in the new ledger, but with debit balances of the former placed on the credit side of the latter, and conversely for the closing credit balances. The counterpoise entries in the various new ledger accounts could then be made, *via* journal entries if preferred, from the opening reversed balance account in the ordinary way, the entries in the latter account thereby being integrated in double-entry fashion.

This procedure is shown clearly in Mathieu de la Porte's *La Science des Négocians et Teneurs de Livres* . . . , first published in 1704.³ De la Porte distinguishes

between the *balance de sortie* and the *balance d'entrée*. He explains the treatment of the credit balances on accounts in the old ledger as follows: 'On portera au Débit de cette Balance d'entrée [in Ledger B], les Articles qui sont au Crédit de la Balance de sortie du Livre A. &, par ce moyen, ladite Balance d'entrée sera débitée, à tous les Créanciers restans du Livre A. auxquels on donnera rencontre, en ouvrant à chacun un Compte que l'on créditera par ladite Balance d'entrée de la somme pour laquelle ils y sont employés, &, de cette manière, chacun des Créanciers du Livre A. sera crédité dans le Livre B. de la somme qui lui reste dûe audit Livre A'.⁴ Edmond Dégrange, writing towards the end of the eighteenth century, and like de la Porte, one of the most important authors of French texts on accounting, also advocated the use of closing as well as of reversed opening balance accounts, and explained their limited functions as he saw them. The *balance de sortie* 'n'a été inventé que pour servir à solder tous les autres, à l'exception de ceux qui doivent être soldés par profits et pertes. Par exemple, pour solder des comptes de tous les débiteurs d'un négociant; on les crédite du montant de ce qu'ils doivent pour solde, et on en débite le compte de balance, comme s'ils avaient payé ce montant à une personne nommée Balance.' The *balance d'entrée*, on the other hand, 'n'a été établi que pour servir à ouvrir de nouveau sur les livres, tous les comptes précédemment soldés par celui de balance de sortie . . . Ainsi, la balance d'entrée suppose nécessairement qu'il en a été déjà fait une de sortie. Pour ouvrir tous les comptes dans leur ordre naturel, par le moyen du compte de balance d'entrée, il faut débiter . . . chacune des personnes qui doivent au négociant, de la somme qu'elles lui doivent pour solde . . . et créditer la balance d'entrée. . . .'⁵

The reversed opening balance account made its first appearance in the literature on bookkeeping and accounts well before the publication of the two books from which the preceding quotations have been taken. The earliest example is in the sixteenth century in Alvise Casanova's *Specchio lucidissimo* (Venice: 1558).⁶ It was used by Angelo Pietra in *Indirizzo degli economi* (Mantua: 1586) and by Lodovico Flori in his *Trattato del modo di tenere il libro doppio* . . . (Palermo: 1636).⁷

Although Casanova was the first author to describe and illustrate the use of the reversed opening balance account, an earlier writer, Jan Ympyn, seems to have had in mind the use of this type of account for the opening of a new ledger. In his *Nieuwe Instructie* . . . (Antwerp: 1543), the index to the second ledger in the illustrative set of account-books includes an entry for the balance account of the preceding ledger, although no such account appears in the second ledger. The opening entries in the individual accounts in the

second ledger refer specifically, however, to their source as the balance account in the preceding ledger.⁸ It seems as if Ympyn adopted an untidy procedure although he was aware of a neater one. In some later works published in the Low Countries there are to be found references, in the opening entries in the new ledger accounts, to a non-existent, but impliedly reversed, opening balance account.⁹

While it is not intended to attempt to trace the presence of the reversed opening balance account in the early literature on accounting, a limited search suggests that it was quite widespread. It is encountered in the seventeenth and eighteenth centuries in texts in French, Dutch, German, Italian Spanish and Portuguese.¹⁰ A particularly interesting discussion is to be found in an influential Dutch text-book which was published in the first half of the nineteenth century, W. Oudshoff, *Volledig Theoretisch en Praktisch Handboek voor het Italiaansch . . . Boekhouden* (Rotterdam: 1833). When explaining the role of the balance account at the periodic (here, annual) balancing of the ledger and the reopening of the accounts in the same ledger, Oudshoff states that the closure holds 'merely for a moment'. 'Therefore, just as the ledger accounts which had debit or credit balances were closed on 31 December, through the interposition of the balance account, so these same accounts must be reopened on 1 January through the medium of the same auxiliary account. But how? If one wished to adhere strictly to the rules according to which one should never enter anything into the ledger that is not recorded in the journal, one would be obliged to enter once more the items in the previously-constructed closing balance account into the journal as entries for posting to the opening balance account, but in the reverse order; but it will be apparent at once that this is not only cumbersome but also wholly redundant.' Instead, he advises that the individual accounts simply be reopened by carrying down their balances, which would have been closed in the closing balance account.¹¹ One imagines, however, that when a new ledger had to be opened, the reversed opening balance account would have been called for.

The first treatment in English of the reversed opening balance account appears in John Weddington, *A Brevve Instruction* . . . (Antwerp: 1567), and is clearly independent of Casanova's earlier exposition (of 1558). Weddington explained the reversal of sides in the opening balance account partly on the ground that it provided a basis for the establishment of the other ledger accounts in the new ledger and partly in terms of linking the new ledger with its predecessor: 'by this manner you shall in Debitor and Creditor lincke, the one great Boke [=ledger], withe the other . . .'.¹² Weddington's example with its own peculiarities was

not followed by other English writers, although the idea of the reversed opening balance sheet does occur from time to time. It is clearly illustrated in the worked example in Abraham Liset, *Amphithalamy, or, The Accomptants Closet* . . . (London: 1660).¹³ Benjamin Booth, 'late of New York, and now of London, Merchant', is worth referring to for his treatment of the ledger-balancing process in his *A Complete System of Book-Keeping* . . . (London: 1789). His discussion is concerned with the balancing and closing of the ledger and the reopening of the accounts in the same ledger. He says: 'I know it has been customary to repeat the balance-list on opening the new accounts', that is, to repeat the journal entries which were made to construct the closing balance account and, by implication, to repeat the balance account to serve as the opening balance account. But he does not recommend this procedure. Instead, the journal entries to close the ledger accounts into the (closing) balance account have two posting columns, the first for posting the entry to close the particular ledger account, and the second for posting the entry to reopen it. This device, he claims, 'must surely be considered as an improvement; since it is equally expressive of its uses, and is performed in half the space, and nearly with one half the trouble'. The narrative of the compound journal entries in the illustrative set of accounts is interesting in that it reveals that the suppressed opening balance account would have been of the reversed type. Thus the journal entry for the debits to the closing balance account runs: 'Balance Dr. to Sundry Accounts // For closing all those Accounts that balance in my favour, and, *vice versa*, for opening them anew'.¹⁴ One imagines, moreover, that the labour-saving device advocated by Booth would not have been recommended by him for use when the ledger-balancing coincided with the substitution of a new ledger for one which had come to the end of its life.

The use of the reversed opening balance account as described in certain bookkeeping manuals can be found in some surviving ledgers, although it is difficult to judge whether the practice was widespread in any country or in any period. Early examples are reported in Italy.¹⁵ A sixteenth-century example is found in the accounts of Dutch partnership trading in Bremen. The heading of the debit side runs: 'Balance of the preceding ledger signed C debtor 20 September anno 1589 *stilo veteri* in Bremen for the following amounts coming from various creditors in the said ledger to close them there, carried over here in order to make them creditors again as follows'.¹⁶ Later specimens have been found in a group of seventeenth- and eighteenth-century account-books in England.¹⁷ The eighteenth-century ledgers of the Bank of

England have both closing and reversed opening balance accounts drawn up annually. Thus the Bank's Ledger No. 12, covering the period from 1 September 1753 to 30 August 1760, opens with an opening balance account in which the asset account 'Treasury or Vault' appears as one of the numerous credit entries. At the end of the first year the same item appears among the debits of the (closing) balance account dated 31 August 1754, and among the credits of the corresponding (opening) balance account dated 3 September 1754; and so on, until in the last (closing) balance account in the ledger the item appears among the debits.

II

The reversed opening balance account – the subject of discussion in the preceding section – was a bookkeeping instrument created deliberately to facilitate the process of the closing and opening of ledgers. The second type of situation which might have served to familiarise accountants and others with the placing of asset balances on the credit side of an account or statement was also connected with the closing and opening of ledgers, but did not involve the deliberate creation for technical reasons of a special account or statement.

When a set of accounts is opened from an itemised inventory of assets and liabilities, either when a merchant begins to trade or when he opens a new ledger, the itemised entries in the capital account, being the counterpoise entries of the entries in the individual asset and liabilities accounts, will show assets on the credit side and liabilities on the debit side. Thus, apart from not having a (debit) entry for the opening capital balance, the opening state of the capital account will resemble that of the reversed opening balance account. This feature of the initial appearance of a capital account was not infrequently commented upon in early textbooks. Thus Benjamin Donn, writing in 1775, draws attention to the nature of the entries in the capital account as counterpoise entries¹⁸: 'Hence, I must form an imaginary Account, called the *Stock Account* [=capital account], which I must make Debtor for all I owe by the Inventory; and Creditor for all the Effects that are in my Hand, and Debts owing to me by the Inventory. Hence this Account may be considered as representing myself, who am the Owner of the Books; the Articles on the Creditor Side shewing what I have in my Possession, and what Debts are owing to me; and those of the Debtor Side, what I owe.' And, somewhat earlier, Richard Hayes referred to the capital account as it would appear after it had been opened with entries from the preceding ledger's balance account¹⁹: 'Now the Dt. Side of the Account of Balance contains only

what is due to a Man, and what his Estate does consist in, and the Ct. Side only what the said Person owes, for what, and to whom those several Debts are owing; the said Account being transposed, it will shew the true State of your Stock; that is to say, make Stock in your new Leger Dr. to all those Accounts mentioned on the Ct. Side of Balance in your old Leger. And then, by making Stock Cr. in your new Books, by every particular Account that is mentioned on the Dt. Side of the Account of Balance in your old Leger. . . .’ And a final example from the nineteenth century: ‘The Stock account contains upon its credit side all the lands, houses, leases, fixtures, engines, merchandise, and credits of the firm; and its debts and liabilities upon its debit side.’²⁰

The itemised opening entries in the capital account, it is suggested, would have made accountants and others familiar with the sight of assets and liabilities on the credit and debit sides, respectively, of accounting records. Indeed, it is possible that the capital account, when it had been reopened after the closing of a ledger, may have offered itself as a convenient representation of the state of affairs of the enterprise in question. It may be noted that the three examples of early British-type ‘balance sheets’ reproduced by Takatera in his recent article in fact *are* capital accounts in description and form.²¹ Thus the statement pertaining to the banker, Richard Hoare, in 1702, is in account form, the debit side headed ‘Mr. Richard Hoare Dr.’, and the credit, ‘P. Contra Cr.’.²² The declaration appended to the statement shows that the capital account was drawn up after an inventory had been taken. The two parts of the statement submitted in 1671 by the East India Company to a general meeting are headed ‘Stock Dr.’ and ‘Stock Cr.’. Finally, the Bank of England’s ‘first public statement of accounts’ in November 1696 was headed ‘Stock for the Honourable the Governor and Company of the Bank of England’.

It will be apparent that the opening entries in the capital account would not display the liabilities and assets in detail unless the corresponding journal entries were simple (i.e. itemised) and not compound. Otherwise the opening entries would consist simply of two aggregate entries, one for assets and the other for liabilities to third parties. Again, if the opening entry in the capital account were simply for the balance of that account taken from the balance account itself, the capital account would consist initially of one entry only, and would be altogether uninformative.²³

III

The preceding discussion of the appearance of the capital account at the beginning of a new ledger leads into my last topic: the exposition of accounting by

Simon Stevin in his ‘Coopmans Bouckhouding’ written around the end of the sixteenth century,²⁴ and the likelihood that this exposition had some influence on the form of the British balance sheet in the nineteenth century.²⁵

For present purposes interest is focused on chapters 9 and 10 of Stevin’s exposition. Chapter 9 is headed ‘Vande Staetmaking of Balance’, which can be translated as ‘Of the Estate-reckoning or Balance’.²⁶ In this chapter Stevin explains how the merchant can calculate (whenever he sees fit) his capital and his profit. On a sheet of paper separate from his ledger or account books he opens an account, and enters on the credit side the assets in his possession, the merchandise being entered at market value, and on the debit side his liabilities. The difference is the capital. The debit side is headed ‘Staet of Capitael debet’, and the credit side ‘Staet of Capitael credit’, which can be translated as ‘Estate or Capital’ debit and credit respectively.²⁷ The ‘staet’ is not in any sense the balance account of early bookkeeping practice. Stevin himself explains that the making of his ‘balance or “staet”’ could also be called the reckoning of the capital’.

Stevin explains and illustrates that, by deducting the opening value of the capital from the calculated closing value, the profit of the intervening period can be determined. This calculation is checked by adding together the individual profits and losses shown in the ledger balances of accounts representing incomes or expenditures (suitably adjusted for the valuations of assets entered in the ‘staet’). In the worked example, there are profits on four merchandise accounts as well as trading and household expenses.

Stevin’s chapter 10 is headed ‘Of the closing of the ledger and the beginning of new books’. This closing procedure becomes necessary when the ledger is full, or the business is terminated, or the owner dies. First it is necessary to compile an ‘estate-reckoning’ with the ‘proof’ of the correctness of the derived profit calculation (as above). Then the balances on the income and expense accounts are cleared through the profit and loss account, and all remaining account balances (adjusted for any revaluations incorporated in the estate reckoning)²⁸ are closed into the capital account in the old ledger.²⁹ This account should balance if there are no mistakes. Thus the old ledger is closed; and, after the new one has been opened (if one is dealing with a continuing enterprise), the old one is ‘dead’. The new ledger is opened by means of journal entries representing the asset and liability balances which were transferred to the capital account at the closing of the old ledger. The appearance of the new capital account would then be the same as that of the ‘staet’ (but without the balancing figure), provided each asset and liability balance was

the subject of a separate journal entry. (Stevin does not illustrate the new ledger.) No balance account is used in the closing procedure, although Stevin was well aware of its use by others. He refers to Barthelémy de Renterghem, who, in his *Instruction Nouvelle* . . . (Antwerp: 1592), repeated the closing balance account of the old ledger as opening balance account (with sides not transposed) in the new ledger and used it as the basis for opening the individual accounts in that ledger. 'Those who prefer this other method, should follow their judgment.'

So much for Stevin's chapters 9 and 10. But how, if at all, could Stevin's procedure for reckoning the estate have been introduced into practice in England in the seventeenth century, or, more remotely, how could it have influenced the arrangement of the model balance sheets included in the companies legislation of the nineteenth century?

In Holland, Stevin's writings on merchants' accounts appear to have had little influence either on later publications or on practice; and in particular his 'staet' and 'staetproof' do not appear to have been taken up in later publications. (His ideas on the accounts necessary for non-profit-making entities had more influence than his writings on commercial accounting.)

Stevin's works were not translated into English, although early translations into French and Latin were published. His exposition of merchants' accounts would to this extent have had even less influence in England than in Holland. However, if it had any influence at all, it is reasonable to suppose that this would have been transmitted through the publications of Richard Dafforne, whose books were published in various editions in London from 1635 throughout the seventeenth century. Dafforne had lived in Holland, knew Stevin and his work, and was the last English author in whose books Dutch influence was pronounced.

Dafforne claimed to have been a friend of the celebrated Stevin. In his *Merchants Mirrour* . . . (first edition, London: 1635) there are several references to Stevin and his work on accounting; and he presents, with proper acknowledgement, a literal translation of Stevin's observations on bookkeeping in antiquity. Examination of Dafforne's exposition of the balancing of the ledger and the closing of books shows, however, that Dafforne did not follow Stevin's prescriptions at all. Even though it is possible that Dafforne may in some respects have influenced practice or his successors in the writing of textbooks in England, it is clear that he did not disseminate Stevin's particular and somewhat idiosyncratic ideas on the 'reckoning of the estate' and the closing of the ledger.

It is clear, however, that Dafforne was familiar with

Stevin's exposition on these subjects. Thus he lists (in the same order) the same three types of circumstances in which a 'Leagers-Conclusion' is to be effected as did Stevin for his closing of the ledger (see above). Moreover, he uses the word 'Estate-reckoning' as a preferred synonym for the term 'Balance account', just as Stevin preferred the use of the term 'staet' for the term 'capital'. Finally, he expresses a clear disapproval of Stevin's procedure for transferring all closing asset and liability account balances to the capital account, in doing so betraying a misunderstanding of Stevin's intentions: ' . . . But at his Leagers concluding . . . he [Stevin] entreth Stock Debitor to his Debtors; and he entreth his Debt-demanders, as Augmentors of his Stock. Such entrances made by him are but a mistake onely; in me they were meer Absurdities.'³⁰ (The term 'augmentors of his stock' is also a direct derivation from Stevin.)

In his *Merchants Mirrour*, Dafforne presents the conventional balancing and closing procedure, introducing his innovation of the 'three-fold-mony-balance'.³¹ A separate balance book or sheet of paper is used. Each side has three money columns. The first pair are for the totals of debits and credits, respectively, of each account in the ledger, 'before any unsold wares, or Gain, and Losse of any accounts be meddled with'; the second pair are for the remaining balances 'when all unsould Wares, and Out-landish monies are rated [i.e. profits or losses on exchange are allowed for]: all Abatements, as likewise Gaines or Losses [on the individual goods or voyage accounts] are known'; and the third pair are the 'true-balance'. This latter balance 'ariseth from the Remainders of Leager accounts; as well in Mony, Unsold Wares, Voyages not wholly sold, Houses, Lands, People &c. not yet completely perfected; and are therefore transported to the New-Books, to be there fully finished: Leaving the Old-Books to their perpetuall rest, except some Scrupulous matter molest them'.³²

Of the opening of the new ledger, where this is necessary, Dafforne has this to say: 'Having drawn all your Leager to a head in your Ballance-Book, and found it to be right taken: then may you take your Journall in hand, and post them [i.e. the balances] as they in order follow upon your Ballance-book, unto your Ballance-account in the Leager. Or if you will not make a Ballance-account in your Leager, you may let your Ballance-book be your private contentment; and transport each Ballance-parcell out of the Old Leager into the New: avoiding your Ballance-writing into the Journall, both at the End of the Old Leager, or beginning of the New: entring into the Old Leager the folio whither carried into the New; and in the New Leager the leaf from whence that remainder is brought out of the Old Leager;³³ and so avoid (perhaps) the

writing of two or three hundred Journall-parcels in both Leagers.³⁴

Dafforne's second book on bookkeeping published in England, *The Apprentices Time-Entertainer Accomptantly* . . . (London: 1640), again shows virtually no influence of Stevin as regards the balancing, opening and closing of ledgers. The discussion is less comprehensive and detailed than in the *Merchants Mirrour*; indeed, for instruction on the closing of the ledger, the reader is referred to the earlier work. There is one novelty. A fold-out sheet is inserted near the beginning of the book. It sets out the system of bookkeeping in a schematic form. One part of this shows the debits and credits for various types of transactions or accounts. The first of the items is 'Estate-Reckoning, termed by us, the Inventory'. In this account is to be entered 'upon the Left-Hand, all that I owe, except the Ballance line; for that is my Estate', and 'upon the Right-Hand, all that is Owing unto me; whether Mony, Wares or People'. It is, in fact, a prescription for a reversed opening balance account. Its special feature, the 'reversal' of debits and credits, is highlighted in the last of the items which refers to the balance account at the end of the trading period: 'Books-Ballancing, or Estates-Reckoning; contrary to the Estates Entrance in the Bookes beginning; entring here upon the Left-Hand, the remaining Mony, . . . remaining unsold Wares in my hands, . . .'.³⁵

Thus in neither of his books did Dafforne describe, explain or illustrate the peculiar estate-reckoning or book-closing procedures of Stevin. There are echoes

of the Dutch master's ideas – but no more. Indeed, to give another example of such an echo, at the foot of the fold-out sheet in the *Apprentices Time-Entertainer* there is a short statement of the nature of Stevin's 'proof' of the correctness of the ledger.

It would have been agreeable if the particular arrangement of assets and liabilities in British balance sheets could have been ascribed to the influence, however remote, of Simon Stevin, a man whose importance in the development of mathematics is well recognised and whose general distinction is celebrated, *inter alia*, in the form of a statue in a square named after him in his home town, Bruges. But the historical record, so far as it goes, lends no credibility to such an attribution. The Englishman most likely to have propagated his novel ideas on accounting did not in fact do so; and to the best of my knowledge, they are not to be found expressed in any other early English treatise on accounting. My own tentative 'explanations' of how assets came to occupy the 'credit' side of the British balance sheet are less romantic but perhaps more plausible than an attribution to Stevin. But whatever the ultimate or proximate causes of the arrangement of the British balance sheet may have been, the student of the history of accounting has reason to suppose that early practitioners of accounting would not have been unaccustomed to accounts or statements in which assets and liabilities occupied the same reversed positions as they do in the British balance sheet.

References

¹ George Lisle (ed.), *Encyclopaedia of Accounting* (Edinburgh: 1903), vol. I, p. 205; quoted in Sadao Takatera, 'Early Experiences of the British Balance Sheet', *Kyoto University Economic Review*, XXXVII (1967), p. 36.

² Takatera, *ibid.*, *passim*.

³ I have consulted the 'nouvelle édition, revûe, corrigée & augmentée' (Paris: 1753). The reversed opening balance account is to be found also in de Porte's earlier *Guide des Négocians* . . .

⁴ De la Porte, *ibid.*, p. 361.

⁵ Edmond Dégrange, *La Tenue des Livres rendue facile* . . . sixth edition (Paris: 1806), pp. 93, 95. The first edition was published in 1795 in Paris.

⁶ The closing and opening balance accounts are reproduced, with translations, in Edward Peragallo, *Origin and Evolution of Double Entry Bookkeeping* (New York: 1938), pp. 66–70.

⁷ Peragallo, *op. cit.*, pp. 80, 88.

⁸ For discussion of this point in respect of the French version of Ympyn's book, see Carl Peter Kheil, *Über einige ältere Bearbeitungen des Buchhaltungs-Tractates von Luca Pacioli* (Prague: 1896), pp. 61–2.

⁹ See, for examples, P. G. A. de Waal, *De Leer van het Boekhouden in de Nederlanden tijdens de Zestiende Eeuw* (Roermond: 1927), pp. 177, 220; K. Bes, *Bijdragen tot de Geschiedenis en de Theorie van het Boekhouden* (Tilburg: 1908), p. 58.

¹⁰ The reversed opening balance account seems to have

been a common feature in French-language texts after de la Porte. It is to be found, for example, in Dégrange (quoted in the text) and in the following: Gobain, *Le Commerce en son jour* . . . (Bordeaux: 1702); Samuel Ricard, *L'Art de bien tenir livres de comptes* . . . (Amsterdam: 1709); Bertrand François Barrême, *Traité des parties doubles* . . . (Paris: 1721); P. J. Mignaret, *La Science des jeunes négocians et teneurs de livres* . . . (Paris: 1798); E. Cadres Marmet, *Principes de tenue de livres* . . . (Paris: 1830); and C. H. Barlet, *Traité complet des opérations commerciales* . . . (Malines: 1857).

The reversed opening balance account is also illustrated or referred to in Jan Coutereels, *Den Stijl van boeckhouden* . . . (Middelburg: 1603); Hendrik Waningen, *Treisor van 't Italiaens Boeckhouden* . . . (Amsterdam: 1613); Jakob van der Schuer, *Kort onderricht over het Italiaens boeckhouden* . . . (Haarlem: 1625); Joachim Rademann, *Ein neues . . . Buchhaltens-Werck* . . . (Hamburg: 1682); Jacob de Metz, *Sendero Mercantil* . . . (Amsterdam: 1697); the anonymous *Tratado sobre as partidas dobradas* . . . (Turin: 1764); Fererio Antonio Farghisoc, *Trattato di scrittura doppia* . . . (Venice: 1787); and Wilhelm Trempenau, *Die geheime Arbeiten der Buchführung* (Quedlinburg: 1876).

A late appearance, or rather re-appearance, of the reversed opening balance account is in Antonio Tonzig, *La Scuola Perfetta dei Mercanti ossia La Scienza della Contabilità Commerciale* (Padua: 1876). Tonzig distinguishes between the 'scrittura doppia italiana' and his own 'la

scrittura doppia migliorata'. According to the author, one difference between the two systems is the use in the latter (but not in the former) of the 'bilancio d'entrata' or 'bilancio primordiale', which is 'una copia inversa del bilancio finale' or 'bilancio d'uscita'.

¹¹ W. Oudshoff, *op. cit.*, pp. 81, 85.

¹² See B. S. Yamey, H. C. Edey and H. W. Thomson, *Accounting in England and Scotland: 1543-1800* (London: 1963) for the relevant extract from Weddington (pp. 114-5), a reproduction of the opening balance account in Weddington's worked example (Plates II and III), and commentary (p. 165, n. 28).

¹³ The closing balance account is shown in A. C. Littleton, *Accounting Evolution to 1900* (New York: 1933), pp. 131-2.

¹⁴ Booth, *op. cit.*, p. 83, and unnumbered page succeeding p. 86.

¹⁵ The reversed opening balance accounts of the Soranzo (1406) and Barbarigo (1430) ledgers are reproduced in full in Plinio Bariola, *Storia della Ragioneria Italiana* (Milan: 1897), and discussed briefly in Fabio Besta, *La Ragioneria*, 2nd edition (Milan: 1932), vol. 3, pp. 304-5, and Peragallo, *op. cit.*, pp. 33-6.

¹⁶ O. ten Have, *De Leer van het Boekhouden in de Nederlanden tijdens de Zeventiende en Achttiende Eeuw* (Delft: 1933), p. 280.

¹⁷ Yamey *et al.*, *op. cit.*, p. 192.

¹⁸ Benjamin Donn, *The Accountant* . . . , second edition (London: 1775), p. 6, reprinted in Yamey *et al.*, *op. cit.*, p. 66.

¹⁹ Richard Hayes, *The Gentleman's Complete Book-keeper* . . . (London: 1741), p. 92. I have changed the punctuation slightly.

See also extract from John Mair, *Book-keeping Methodiz'd* . . . (Edinburgh: 1741), in Yamey *et al.*, *op. cit.*, pp. 118-21; and M. Postelthwayt, *Universal Dictionary of Trade and Commerce* . . . (London: 1761), p. 198, where the state of the capital account of a bank at the opening of a new ledger is illustrated.

²⁰ Isaac Preston Cory, *A Practical Treatise on Accounts* . . . , second edition (London: 1839), p. 90.

²¹ Takatera, 'Early Experiences . . .', *op. cit.*, pp. 39, 41-2, 44.

²² The owner's name could be used instead of the term 'capital'. Thus Jean Belot, in his *Korte onderrichtingen van't Italiaensche boeck-houden* (Haarlem: 1641) refers to the account 'capital or name'. O. ten Have, *De Leer van het Boekhouden* . . . , *op. cit.*, p. 55. Gerrit la Borde, in his *'T Koopmans Boekhouden* . . . (Amsterdam: n.d.), wrote in connection with the entries for the assets in the opening inventory that 'one credits the merchant, or preferably his capital'.

Simon Stevin, in his treatise which is discussed in Section III, explained to his pupil, Maurice, Prince of Orange, why the word 'capital' was to be preferred to the name of the owner of the enterprise in the title of the capital account, when the pupil claimed that this use was confusing. First, sometimes there is a collective capital, as in a company, and then the use of the word 'capital' is necessary. Second, 'because the wealth or resources a man has in a particular business is a matter of great moment, it is imperative that in all bookkeeping one should use a common, well-known and outstanding name . . .', namely the word capital.

²³ For such an 'uninformative' capital account, see the example in a ledger of Sir John Banks, reproduced in Yamey *et al.*, *op. cit.*, Plates VIII and IX.

Richard Dafforne advised against this practice, and suggested itemised entries: ' . . . and your present Estate in your New Books, cannot by a stranger that should cast an eye into them, be discerned, as when your Estate standeth in one entire summe. This for advice, each do his pleasure'. *Merchants Mirrour*, third edition (London: 1660), unnumbered page beginning 'Un-weari'd Learner . . .'.

The anonymous author of *De Amsterdamsche Koopman* . . . (Amsterdam: 1791) observes that some merchants did not bring down as a new balance the balance on their capital account at the end of each year. They did not want their clerks to know precisely how much they were worth ('some because they had more credit than capital').

²⁴ The exposition of mercantile accounting is in the section 'Coopmans Bouckhouding op de Italiaensche Wyse' in the second part of the 'Ghemengde Stoffen' entitled 'Van de Vorstelicke Bouckhouding' of Stevin's *Wisconstige Gedachtenissen*. I have consulted the edition of 1608, published in Leiden by J. Bouwensz. The 'Vorstelicke Bouckhouding' was published as a separate volume by the same publisher in 1607.

For a short account of Stevin's life and work, see O. ten Have, 'Simon Stevin of Bruges', in A. C. Littleton and B. S. Yamey (eds.), *Studies in the History of Accounting* (London and Homewood, Illinois: 1956), pp. 175-84.

²⁵ For suggestions of this influence, see de Waal, *op. cit.*, p. 263; Littleton, *Accounting Evolution* . . . , *op. cit.*, p. 134; B. Stevelinck and R. Haulotte, 'Simon Stevin', 'Galerie des Grands Auteurs Comptables', *Documentation Commerciale et Comptable*, no. 209, p. 35; and Takatera, *op. cit.*, p. 38.

²⁶ 'Estate-reckoning' is Dafforne's word; see below.

²⁷ Stevin's illustration of the 'staer' is reprinted in Takatera, *op. cit.*, p. 38, and, translated into English, in Littleton, *op. cit.*, pp. 132-4. The title given to the statement, 'Estate of Capital . . .', should read 'Estate or Capital . . .'; and the ledger folio references in the original are omitted.

²⁸ Thus the closing credit entry in the pepper account runs: 'By Capital fol. 2 because in the estate-reckoning is found 120 m. pepper now worth . . .'

²⁹ This procedure is reminiscent of that used by the German, Valentin Mennher, in his various works on accounting published in Antwerp, where he lived and taught for many years, and elsewhere between 1550 and 1565.

³⁰ Dafforne, *op. cit.*, third edition, p. 46.

³¹ Dafforne wrote in the *Merchants Mirrour* that his 'Great Waste-Book' with the three-column arrangement was 'printed 1621 at Amsterdam in English, and Dutch'. No copy appears to have survived, and it is not clear whether there were two separate publications. In another book (not on bookkeeping) by Dafforne, *Grammatica ofte Leers-leerlings-Staensel* (Amsterdam: 1627) he writes that he had already written one book, on bookkeeping. This, he says, was severely criticised, and 'the envy of some people since the publication of my Memorial (in the Dutch and English languages) on bookkeeping has affected me so grievously that I had almost banished all inclination to write'. The reference is presumably to the *Great Waste-Book*. Dafforne overcame his reluctance to write, as we have seen. (For details of the *Grammatica*, I am indebted to Mr. Henry L. V. de Groote, who refers as his source, P. A. de Planque, *Valcooch's Regel der Duytsche Schoolmeesters* (Groningen: 1926). Professor T. Weevers has helped me with the translation of the sentence cited above).

The three-fold 'general balance or Estate-reckoning' of the *Merchants Mirrour* is reprinted in Littleton, *op. cit.*, pp. 138-9.

³² Dafforne, *Merchants Mirrour*, *op. cit.*, pp. 46-7.

³³ Dafforne is referring to the direct posting from one ledger account in the old ledger to its successor in the new, without assistance of a balance account or a journal entry.

³⁴ Dafforne, *op. cit.*, p. 51.

³⁵ A folding-sheet closely similar to Dafforne's in both lay-out and content is to be found in Sybrant Cardinael, *Boeckhouden van allerley koopmans handelighen* . . . (Amsterdam: 1648); see ten Have, *De Leer van het Boekhouden* . . . , *op. cit.*, p. 62 and Plate 8. If Cardinael took over the schema from Dafforne, this would be one of the rare instances of a Dutch author having drawn on an English model.

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